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DRAFT OPERATION AND MAINTENANCE PLAN



**Draft
Operation and Maintenance Plan**

**Construction/Operation Level
Design Report
Corrective Action Management Unit
Grand Calumet River
Sediment Remediation Project**

**U.S. Steel - Gary Works
Gary, Indiana**

*Prepared for
U.S. Steel Group
Pittsburgh, Pennsylvania*

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LIST OF DRAWINGS

The Operation and Maintenance Drawings will be the same Drawings as those submitted with the Construction Completion Report after CAMU Construction. It is anticipated that the Construction Completion Report will contain the following drawings:

- Title Sheet
- Record Dewatering System Layout (including barrier wall)
- Record Base Grades (including perimeter structures)
- Geomembrane Panel Layout (for both primary and secondary geomembranes)
- Record Leak Detection System Layout
- Record Leachate Collection System Layout
- Record Storm Water Management Layout
- Cross Sections
- Details

The actual drawing numbers are not known and each is indicated with “??”

LIST OF APPENDICES

The Operation and Maintenance Appendices will include the following:

- Correspondence
- Leachate Analytical Testing and Permitting Information
- Monitoring and Maintenance Forms/Logs
- Project Equipment Supplies and Contractors Information
- Spare and Replacement Equipment/Parts Information
- Equipment O&M Manuals Provided by Suppliers/Manufacturers

The actual appendices will be put together using information gathered during construction as provided by the project equipment suppliers, manufacturers, and contractors. The actual appendix letters are not known and each is designated as “Appendix ??”.

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1.0 INTRODUCTION

This Draft Operation and Maintenance Plan (O&M Plan) has been prepared in conjunction with the Corrective Action Management Unit (CAMU) Design for the Grand Calumet River Sediment Remediation Project at the U.S. Steel - Gary Work Facility in Gary, Indiana. This Draft O&M Plan addresses activities that will occur after construction of the CAMU and during operation of the CAMU. Operation and Maintenance (O&M) includes land surface care for the exterior perimeter berms (including on-site roadways and security fences) and operation of the dewatering system, leak detection and leachate collection systems, storm water management system, and protection of the CAMU geosynthetic liner system. (Note: Portions of this plan have purposely been written in the present or past tenses, to reflect the document's future use. This O&M Plan will be updated after construction of the CAMU is completed.)

1.1 PURPOSE AND SCOPE

This Draft O&M Plan is intended to provide O&M personnel with general information needed for monitoring of the exterior perimeter berms; operation of the dewatering system, leachate detection and leachate collection systems, and storm water management system at the CAMU; and protection of the geosynthetics during operation of the CAMU. This Draft O&M Plan consists of the text, tables, figures, Drawings ?? through ??, and Appendices A through ???. Tables, drawings, and appendices are developed based on the actual construction of the components of the exterior perimeter berms, dewatering system, leak detection and leachate collection systems, storm water management system; and geosynthetic liner system. This O&M Plan includes descriptions of each system and its components, O&M, monitoring, testing, operating problems, corrective measures, general safety precautions to follow when working with the systems, record keeping, and reporting information. A general O&M and monitoring schedule summary will be included. The Appendices will contain significant project correspondences; information regarding leachate removal and treatment; monitoring forms; analytical testing of leachate; and system equipment suppliers, subcontractors, and spare parts information.

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2.0 DEWATERING SYSTEM

2.1 DEWATERING SYSTEM OPERATION

The dewatering system will operate prior to and during construction of the CAMU liner system and support structures and continue until dredging operations begin. U.S. Steel must request approval from USEPA to cease dewatering after CAMU construction is finished. After receiving USEPA approval and before terminating pumping, the CAMU operating contractor must see that the water level inside Units 1 and 2 is at least at the elevation of the water table outside the barrier wall. This will balance the hydrostatic pressures that would act on the liner system if the water table inside the barrier wall fully recovers. The dewatering system will remain in operating condition during the operating life of the CAMU, even though it has been turned off.

2.1.1 Theory of Operation

The dewatering system will be installed to lower the water table approximately 22 ft (from high water tables conditions) to an elevation of approximately 568 ft MSL. Lowering of the groundwater table is necessary to enable construction of the liner system for the CAMU which is below the existing water table. It is anticipated that the dewatering system will operate until construction has been completed and may continue operating during initial filling of the CAMU. The dewatering system layout is shown on Drawing D??.

2.1.2 Dewatering System Description

The dewatering system will consist of a series of dewatering wells that will be installed to remove the groundwater within the barrier wall and a forcemain for discharge to a common groundwater collection manhole. The forcemain consists of a continuous loop around the entire CAMU with shut-off valves at each well location. The shut-off valves allow portions of the forcemain to be isolated and water to be re-directed in case of maintenance requirements. The forcemain pipes are installed without a slope on the pipe. The collection manhole is used as a lift station for discharge to Outfall 032.

2.2 NORMAL OPERATION, MAINTENANCE, AND MONITORING

2.2.1 System Operation

The CAMU dewatering system operations can be accomplished manually or automatically. Automatic operation is the preferred method, since it utilizes all the fault recognition and diagnostic capabilities of the system controls. In the manual mode of operation, all safety features may not be employed. To operate the dewatering system, O&M personnel must be experienced and follow certain procedures for performing maintenance on the system. The

following discussion describes procedures for performing maintenance on the dewatering system components.

2.2.2 System Maintenance

Periodic maintenance is required of any dewatering system in order to keep it running efficiently. Because the dewatering system is dependent on the integrity of the wells, pumps, and conveyance system, it is critical to perform routine maintenance. Refer to Appendix ?? for the O&M manuals supplied by the manufacturers of the dewatering system components for additional maintenance information. An O&M and Monitoring Schedule summary is presented later in this O&M Plan indicating general maintenance tasks. Refer to Appendix ?? and ?? for the List of Spare Parts and the Project Suppliers and Subcontractors.

2.2.2.1 Dewatering Pump Maintenance. Dewatering well pumps must be routinely inspected to maintain proper operation. Pressure transducers shall also be inspected and cleaned as necessary so that the pump runs when needed.

2.2.2.2 Conveyance Piping Maintenance. Careful, diligent maintenance of the conveyance piping is important to the effective operation of a dewatering system. The conveyance pipes should be cleaned, when necessary, using a high pressure sewer cleaning system. This will remove sediment build-up and allow water to flow freely through the conveyance system. Maintenance should only be performed by trained personnel and with the proper equipment. The equipment referenced in subsequent sections of this O&M Plan are recommended for proper system maintenance. See Appendix ?? for Monitoring Data Forms. The Standard Operating Procedures (SOP) for the flow meter is presented in Appendix ??.

2.2.2.3 Collection Manhole Pump Maintenance. Dewatering well pumps must be routinely inspected to maintain proper operation. High/low water float switches shall also be inspected and cleaned, as necessary, so that the pump runs when needed.

2.2.3 Groundwater Discharge Monitoring

Based on established background water quality results, groundwater quality is acceptable to discharge directly to a surface impoundment or surface water without treatment. Periodic monitoring of groundwater discharge is required to document any changes in groundwater quality with time.

2.2.4 Barrier Wall Performance Monitoring

The barrier wall consists of low permeability materials that limits the infiltration rate of groundwater into the area of CAMU excavation. To monitor the performance of the barrier wall, monitoring wells outside of the barrier wall will be observed for drawdown during pumping. If wells outside the barrier wall show drawdown is likely occurring due to

dewatering, the barrier wall may contain a higher permeability 'window' that may need to be repaired, or accounted for in dewatering operations.

2.3 O&M SCHEDULE

The following O&M and Monitoring Schedule indicates the O&M, monitoring, and sampling activities that are necessary to successfully run the dewatering system. The schedule accounts for those items that are required and those that are recommended.

Weekly Activities (Use Weekly Form in Appendix ??)

- Site Conditions
 - Weather
 - General inspection
- Dewatering Wells
 - Visually check panel indicator light
 - Elapsed hour meter reading
 - Valve settings
 - Flow rates
 - General inspection
- Groundwater Collection Manhole Pumps
 - Check liquid level (volume)
 - General inspection
- Main Control Panel
 - Visually check panel indicator lights
 - Heat cable status
 - Elapsed hour meter reading
 - General inspection

Monthly Activities (Use Monthly Form in Appendix ??)

- Dewatering Wells
 - Valve setting
 - Pressure Transducer Operation
 - Flow Rate
 - General inspection

Quarterly Activities (Use Quarterly Form in Appendix ??)

- All Valves
 - Exercise valves by operating throughout entire range of motion several times.
- Pumps
 - Refer to manufacturer's pump maintenance requirements.
- Collection Manhole
 - Required analytical testing per discharge permit.

Annual Activities (Use Annual Form in Appendix ??)

- Pumps
 - Inspect pumps and operation
- Manhole
 - Inspect water level floats and warning light operation
 - Inspect pumps and operation
- Padlocks
 - Lubricate with grease and verify working condition

2.4 POTENTIAL OPERATIONAL PROBLEMS

2.4.1 Description and Analyses

During dewatering system operation, minor to significant problems can occur that will limit the ability of the system to function properly. Problems may result from the methods used to operate the system and from parts failure. Malfunction of dewatering system components may develop gradually over time or occur suddenly. Minor problems are those that can typically be corrected quickly by making operational adjustments, or simple repairs that result in little to no system down-time. Significant problems, however, may require termination of the dewatering system operation until the problem is corrected. Only those problems that are typically encountered are presented. A thorough knowledge of dewatering systems is necessary to respond to all potential situations.

2.4.2 Dewatering System Components

2.4.2.1 Dewatering Pump. Routine monitoring will indicate that dewatering pumps are operating properly. Potential operating problems and remedies are described as follows:

- Pressure Transducers may fail to work properly.
- Pumps may deteriorate with time.

Maintenance and repairs of the dewatering pumps will be made as identified during routine inspections based on manufacturer's recommendations. Refer to Appendix ?? for the O&M manuals supplied by the manufacturers of the pumps for additional information.

2.4.2.2 Conveyance Piping. The primary operational concerns regarding the conveyance piping system is siltation and freezing which can limit flow. Caution must be taken to prevent pipe breakage from other site construction activities.

2.4.2.3 Collection Manhole Pump Maintenance. Potential operating problems and remedies are described as follows:

- Water level switches may corrode and fail to work properly.
- Pumps may deteriorate with time.

Maintenance and repairs of the collection manhole pumps will be made as identified during routine inspections based on manufacturer's recommendations. Refer to Appendix ?? for the O&M manuals supplied by the manufacturers of the pumps for additional information.

2.4.2.4 Barrier Wall. The performance of the barrier wall will be monitored by observing drawdown in existing groundwater monitoring wells located outside the barrier wall.

2.4.2.5 Electrical and Controls. The electrical service to the CAMU dewatering system extends from the ?????? to the CAMU service entrance near the ??????. Operational problems are not anticipated for the electrical service. Control system components will periodically fail and will require replacement. The control systems will be maintained routinely as recommended by the manufacturer.

2.4.3 Troubleshooting

At times, the dewatering system will react to situations which were not previously recognized. The operator must determine the cause of the reaction and decide how to remedy the problem. Some troubleshooting procedures are outlined below. For situations not covered below, refer to Appendix ?? for additional O&M information provided by the manufacturers.

<u>Problem</u>	<u>Investigation/Procedure</u>
Loss of flow at well	<ul style="list-style-type: none">• Check well for frozen conditions.• Check upstream and downstream for large pressure change to indicate location of liquid blockage.
Pump failure	<ul style="list-style-type: none">• Check Pressure Transducer Operation• Check control system and electrical service

2.5 CORRECTIVE ACTION

Implement corrective actions in the event that the performance and compliance standards are not being met during dewatering system operation. The standards established for the dewatering system include:

- Allow dewatering to the target groundwater level in the necessary timeframe to establish the subbase grades of the CAMU.
- Maintain the target groundwater level until dewatering system shut-down is approved.

If the dewatering system design performance, or compliance standards are not being met during operation and system equipment problems are responsible, take response measures as described in previous sections of this O&M Plan.

If the system, and its components, are functioning properly and standards are not being met, corrective action must be taken. The following corrective actions are discussed as related to specific design standards.

2.5.1 Description of Corrective Actions

2.5.1.1 Freezing Water Lines. If operation of any dewatering system component fails as a result of freezing liquid, corrective measures must be taken. Measures include the installation of insulation and may include heat trace wire. System locations that may likely have water freeze are exposed piping, including the wellheads and manhole inlet piping.

2.5.1.1 Barrier Wall Performance. If target groundwater elevations are not attained due to poor barrier wall performance, the barrier wall must be repaired, or additional dewatering wells or larger pumps may be installed in the existing wells to maintain the dewatering schedule and target groundwater elevation.

2.5.2 Implementation Schedule

In the event that dewatering rates are not being met, the response must be made with respect to the risk. If the initial target groundwater elevation is not reached at the desired rate, impending construction schedules must be considered. During dewatering, the temporary stand pipes will be monitored for groundwater elevation weekly. A record of the groundwater elevations will be maintained by the CAMU operating contractor. The recorded elevation and lapse time since beginning dewatering will be compared to the anticipated dewatering schedule to determine if the target water table will be met on schedule.

If the target groundwater elevation is not able to be maintained after filling of the CAMU begins, an alternative groundwater elevation must be determined such that outside hydrostatic pressures do not exceed internal hydrostatic pressures within the CAMU. The actual action and schedule of response should be determined based on the investigation findings.

2.5.3 General Safety Precautions

Confined space entry precautions must be followed in the event that entrance into the groundwater collection manhole is required.

2.6 RECORDS AND REPORTING

2.6.1 Daily Operating Logs

A daily operation log must be maintained for the dewatering system in a suitable on-site location and accessible during site visits. A suitable location may be within an on-site storage or maintenance building. This log must report at a minimum the following information:

- Date and time of data entry

- Date and time of data entry
- Operational status of the system
- Details regarding any system faults or alarms
- Maintenance performed
- Noted system deficiencies requiring action

A daily log form is included in Appendix ?? for use by O&M personnel.

2.6.2 Laboratory Records

A copy of all analytical results related to the dewatering system must be maintained in a suitable on-site location and accessible during site visits. A suitable location may be within an on-site storage or maintenance building. Required analytical testing is described in previous sections of this O&M Plan. Refer to Appendix ?? and ?? for subcontracted laboratories information.

2.6.3 Operating Costs Documentation

A copy of operating costs accrued related to the dewatering system must be maintained in a suitable on-site location and accessible during site visits. A suitable location may be within an on-site storage or maintenance building. The costs documented should include:

- System components repaired or replaced
- Monitoring equipment purchased, repaired, or replaced
- Investigations
- Corrective actions
- Routine monitoring and O&M
- Sampling and testing
- All labor including that which was subcontracted

2.6.4 Personnel Records

The staff present during monitoring and O&M activities must be identified on the applicable forms prepared for documenting project activities. The forms are included in Appendix ??.

2.6.5 Maintenance Records

A copy of all records related to maintenance of the dewatering system must be kept on-site in an accessible location for reference. A suitable location may be within an on-site storage or maintenance building. The records must indicate what action was taken, by whom, and cost of maintenance or repairs. A maintenance record form is included in Appendix ?? for use by O&M personnel.

2.6.6 Reporting Emergencies

Emergencies that result during monitoring and O&M of the dewatering system should be handled as described in the Site Safety Plan included in Appendix ??. A list of responsible project personnel and an Emergency Reporting Reference Sheet are included in Appendix ??. This sheet provides the basic information necessary to respond to project emergencies. This sheet should be placed at several locations on-site for ease of reference.

2.6.7 Notification of Temporary Shut-Down

If for any reason the dewatering system is interrupted, or stopped, for a period greater than 24 hours the Agencies will be notified within 48 hours of the shutdown. The Agencies must be notified by telephone, which must be confirmed in writing within five days after the date of the telephone notification. The Agencies must be notified of the nature and cause of the interruption or cessation of operation, as well as the estimated length of time before operation of the system will resume.

2.6.8 Reporting to USEPA

Progress reports will be issued to the Agencies on a semi-annual basis. All monitoring, O&M, analytical testing results, and associated information must be reported to the Agencies for the previous six months of operation.

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3.0 EXTERIOR PERIMETER BERM ROADWAYS, AND FENCE

Routine maintenance of the exterior berm, roadways, and security fence is required to reduce erosion and provide the necessary site security.

3.1 BERM MAINTENANCE

Maintenance of the exterior perimeter berm cover, which consists of topsoil and vegetation, includes site inspections and repair activities. Inspections will be performed quarterly for the first five years and annually, thereafter. Maintenance activities will include the following:

- Inspect drainage swales, infiltration basins, and culverts for the deposition of sediment and other debris that would hinder the flow of water. Remove and appropriately dispose of such materials, if found.
- Repair eroded soil areas on the berms, including roadways at the top of berms and around the perimeter of the CAMU.
- Maintain a good vegetative cover on the berms to prevent erosion. Do not allow trees or shrubs to germinate on the berms unless included in the landscaping plan for the CAMU.
- Reseed repaired soil areas after each repair.
- Mow exterior berm areas annually.

3.2 ROAD MAINTENANCE

Maintenance of the on-site roadways which include the perimeter roads, top of berm roads, and the top of berm ramps include inspection and repair activities. Inspections will be performed quarterly during active operation of the CAMU and annually thereafter. Maintenance activities will include the following:

- Inspect roadway surfaces for erosion, settlement, or washout.
- Repair eroded areas with surface course material and/or base course material.
- Regrade road surface as necessary for all weather access.

3.3 SECURITY FENCE

Maintenance of the security fence, which includes poles, fence, gates, locks, and signs, includes site inspection and repair activities. Inspections will be performed semi-annually. Maintenance activities will include the following:

- Inspect fence, gates, locks, and signs for vandalism and proper operation.
- Repair or replace any portion of the fence, gates, or locks that are not functioning properly.

3.4 RECORD KEEPING

A copy of field observations and maintenance performed on the exterior perimeter berms roadways and fence must be kept on-site. A suitable location may be within an on-site storage or maintenance building. The records must indicate what action was taken, by whom, and cost of maintenance or repairs. A maintenance record form is included in Appendix ?? for use by O&M personnel.

3.5 REPORTING EMERGENCIES

Emergencies that result during monitoring and O&M of the berms, roadway, or fence should be handled as described in the Site Safety Plan included in Appendix ??. A list of responsible project personnel and an Emergency Reporting Reference Sheet are included in Appendix ??. This sheet provides the basic information necessary to respond to project emergencies. This sheet should be placed at several locations on-site for ease of reference.

3.6 REPORTING TO USEPA

Progress reports will be issued to the Agencies on a semi-annual basis. All monitoring, O&M, analytical testing results, and associated information must be reported to the Agencies for the previous six months of operation.

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4.0 LEAK DETECTION AND LEACHATE COLLECTION SYSTEMS

The leak detection system consists of a geonet composite and a series of collection pipes, collection sumps, conveyance piping, and manholes as shown on Drawing D??.

Leachate control encompasses collection and transfer piping, granular drainage blanket on the base, geonet composite on the sidewalls, and withdrawal handling features to minimize leachate accumulation on the liner. The leachate control system is shown on Drawing D??.

4.1 LEAK DETECTION/LEACHATE COLLECTION SYSTEM OPERATION

4.1.1 Theory of Operation

The leak detection and leachate collection systems are constructed and operated similarly, therefore, they are discussed concurrently within this section. Leak detection and leachate collection systems generally consist of a network of horizontal collection pipes bedded in granular material and connected to a header pipe. Collection pipes slope to the collection header, which in turn, slopes to collection sumps. A submersible pump is used to convey the leachate from the collection sumps to the conveyance pipe network located at the top of the perimeter berms. The collected leachate is then directed to a manhole before being pumped to the Project Specific Wastewater Treatment Plant (PSWTP) where it is treated and discharged to Outfall 032.

Proper operation allows the leak detection and leachate collection systems to meet the design objectives, which include:

- Allow sediment within the CAMU to dewater by providing a continuous bottom drainage way once dredging has been completed.
- Limit leachate accumulation above the liner to a depth of one foot following initial passive dewatering of the dredge sediments.
- Monitor the integrity of the primary geomembrane under using the leak detection system.

4.1.2 Leak Detection and Leachate Collection System Description

The leachate collection system is designed to allow a bottom drainage way for the passive dewatering of dredged sediments placed in the CAMU. The leak detection system is designed to assess the effectiveness of the liner system in containing leachate within the CAMU. The leachate is removed from the CAMU via gravity drainage through a series of perforated collection pipes which slope to a collection header pipe. The collection header

slopes to collection sumps which house submersible pumps that convey the leachate to a network of conveyance pipes located at the top of the perimeter berms.

4.1.2.1 Collection Pipes. To maintain proper drainage of leachate from the CAMU, the perforated collection pipes must remain free of sediment which could prohibit the drainage of leachate from the overlying sediment. To maintain an open drainageway, each collection pipe has a clean-out riser that extends up the sideslope of the CAMU. Refer to Drawing ?? for collection pipe details.

4.1.2.2 Pumps. The collection pipes drain to collection sumps via a collection header pipe. Sumps house collection pumps that convey leachate to conveyance pipes for treatment at the PSWTP. To allow proper vertical drainage of water from the dredged sediment, a downward vertical gradient must be maintained within the CAMU. This gradient is achieved by pumping the leachate that collects in the sumps and removing it from the CAMU. The leachate collection pumps are activated when the leachate level reaches the pump-on level switch. The pump runs continuously until the leachate level in the sump drops to the pump-off elevation. Refer to Drawing ?? for the collection sump details and to Appendix ?? for additional O&M information.

4.1.2.3 Conveyance Pipe. The conveyance pipe transports leachate from the collection sumps to the PSWTP. The conveyance lines are forcemains with no slope on the pipe. The forcemains must remain free of sediment which could prohibit the conveyance of leachate. Access to the forcemains are provided at each pipe connection manhole. Refer to Drawing ?? for conveyance pipe details.

4.1.2.4 Pipe Connection Manholes. Sump pump outlets connect to the forcemain in pipe connection manholes (CM1-1, CM1-2, CM2-1, CM2-2) located at the top of the berm. Pipe connection manholes, CM1-2 and CM2-2 are located at the northwest corner of Unit 1 and the northeast corner of Unit 2, respectively. The leachate extracted from Unit 1 travels through, and is metered in, CM1-2. The leachate from Unit 2 travels through and is metered in CM2-2. CM1-2 and CM2-2 consist of a buried PE box containing pipe connections, mutating disc flow meters, and sample ports. Refer to Drawings ?? and ?? for pipe connection manhole locations and details, respectively.

4.1.2.5 Electrical and Controls. The electrical service to the CAMU leachate collection and leak detection sump pumps is 480-volt, 3-phase, 4-wire power and extends from the ?????? to the CAMU service entrance near the ??????. At the service entrance, the power runs through the utility's meter and through the main disconnect before being transformed down as necessary and directed to the appropriate equipment. Within an enclosure, the electrical and control panels are housed for operation of the leachate extraction system and its components. Additionally, power extends underground to the ??????. The specific configuration of the control panels, system operating logic, actual power specifications, and drawings are described in Appendix ??.

4.1.2.6 Prescribed Treatment Conditions. Both the leachate extracted from the leachate collection and leak detection system operation require treatment prior to discharge to the Grand Calumet River. During automatic system shutdown, the pneumatic fail-close valve at the PSWTP will close to prevent the discharge of untreated leachate to Outfall 032. Routine sampling of leachate is described in later sections of this O&M Plan. The discharge permit and required analytical testing program for the leachate is included in Appendix ??.

4.2 NORMAL OPERATION, MAINTENANCE, AND MONITORING

4.2.1 System Operation

The CAMU leak detection and leachate collection system operations can be accomplished manually or automatically. Automatic operation is the preferred method, since it utilizes all the fault recognition and diagnostic capabilities of the system controls. In the manual mode of operation, all safety features may not be employed. To operate the leak detection and leachate collection systems, O&M personnel must be experienced and follow certain procedures for performing start-up and shut-down for safe and proper system operation. The following discussion describes procedures for performing start-up and shut-down of the system components.

4.2.1.1 System Shut-Down. The entire system or parts of the system may need to be shut down when maintenance is required. To shut down the entire system, perform the following tasks:

- Terminate power to the leachate extraction system.
- Drain any remaining leachate from the forcemain system.
- Follow standard health and safety procedures.

4.2.2 System Maintenance

Periodic maintenance is required of any leak detection and leachate collection system to keep it running efficiently. Because leak detection and leachate collection systems are dependent on the integrity of the collection pipes, sump pumps, and conveyance system, it is critical to perform routine maintenance. Refer to Appendix ?? for the O&M manuals supplied by the manufacturers of the leak detection and leachate collection system components for additional maintenance information. An O&M and Monitoring Schedule summary is presented later in this O&M Plan indicating general maintenance tasks. Refer to Appendix ?? and ?? for the List of Spare Parts and the Project Suppliers and Subcontractors.

4.2.2.1 Collection Piping Maintenance. Careful, diligent maintenance of the collection piping is extremely important in the effective operation of a leak detection and leachate extraction system. The collection pipes should be cleaned at a minimum once per year using a high pressure sewer cleaning system. This will prevent siltation and allow leachate to migrate freely into the collection system. Maintenance should only be performed by trained personnel and with the proper equipment. The equipment referenced in subsequent sections of this O&M Plan are recommended for proper system maintenance. See Appendix ?? for Monitoring Data Forms. The Standard Operating Procedures (SOP) for the flow meter is presented in Appendix ??.

4.2.2.2 Collection Pump Maintenance. Leachate collection pumps must be routinely inspected to maintain proper operation. High/low water float switches shall also be inspected and cleaned as necessary so that the pump runs when needed.

4.2.3 Proposed Leachate and Leak Detection Monitoring

The proposed leachate sampling program of the COLDR will consist of two sampling points as shown on Drawing D4 of the COLDR. Each sampling point will provide a leachate sample from the leachate collection system in Unit 1 (L1) and Unit 2 (L2). In addition, a liquid sample will be obtained from the leak detection systems beneath Units 1 and 2 if liquid is present. These detection sampling points are designated as D1 (Unit 1) and D2 (Unit 2). The sample ports for L1 and D1 (Unit 1) are both located at pipe connection manhole CM1-2, and the sample ports for L2 and D2 (Unit 2) are both located at pipe connection manhole CM2-2.

The rate of leachate removal will be record weekly during the active life of the CAMU. The frequency for leak detection sampling in Unit 1 is monthly, in accordance with the TSCA approval. Sampling of Unit 1 leachate, and Unit 2 leachate and leak detection liquid, is proposed on a quarterly basis.

The list of parameters for the leachate and leak detection sampling program is located on Drawing D4 of the COLDR. Initially, this list is the same as the groundwater list, and is comprised of constituents previously detected in samples of the dredge material and of constituents that may be present. The list satisfies the TSCA approval for Unit 1 leak detection monitoring. Again, because the parameter list is very large and many of the constituents may not be present in the dredge spoils, an annual review of detections will be performed and recommendations made for reductions to the parameter list. A reduced frequency of sampling may also be proposed based on annual reviews of detections.

In accordance with the TSCA approval, the volume of liquid pumped monthly from the Unit 1 leak detection sumps will be metered and recorded. Also, the maximum monthly water pond elevation in Unit 1 will be recorded and reported annually.

The Disposal Permit information is included in Appendix ??.

4.2.3.1 Monitoring Equipment. The steps needed to perform monitoring of the leachate extraction system generally includes documentation of leachate flow rates and sampling activities. The standard operating procedures and equipment information are provided in the Appendix ??; O&M Personnel should be familiar with this document. The frequency of monitoring tasks is described on the O&M Monitoring Schedule.

4.3 O&M AND MONITORING SCHEDULE

The following O&M and Monitoring Schedule indicates the O&M, monitoring, and sampling activities that are necessary to successfully operate the leak detection and leachate extraction systems. The schedule accounts for those items that are required and those that are recommended.

Weekly Activities (Use Weekly Form in Appendix ??)

- | | |
|---|--|
| • Site Conditions | - Weather
- General inspection |
| • Sump Pumps | - Visually check panel indicator lights
- Elapsed hour meter reading
- Flow rates and volume
- General inspection |
| • Leachate Collection Manhole | - Check liquid level (volume)
- General inspection |
| • Pipe Connection Manholes
(CM1-2 and CM2-2) | - Flow rates
- General inspection |
| • Main Control Panel | - Visually check panel indicator lights
- Heat cable status
- Elapsed hour meter reading
- General inspection |

Monthly Activities (Use Monthly Form in Appendix ??)

- | | |
|--------------|--|
| • Sump Pumps | - Valve setting
- Water level switch operation
- Flow rate
- General inspection |
|--------------|--|

Quarterly Activities (Use Quarterly Form in Appendix ??)

- | | |
|--------------|---|
| • All Valves | - Exercise valves by operating throughout entire range of motion several times. |
| • Pumps | - Refer to pumps information in Appendix ??. |
| • Manhole | - Required analytical testing per discharge permit. |

Annual Activities (Use Annual Form in Appendix ??)

- | | |
|------------|--|
| • Pumps | - Inspect pumps and operation. |
| • Manhole | - Inspect water level floats and warning light operation |
| | - Inspect pumps and operation |
| • Padlocks | - Lubricate with grease and verify working condition |

4.4 POTENTIAL OPERATING PROBLEMS

4.4.1 Description and Analyses

During leak detection and leachate collection system operation, minor to significant problems can occur that will limit the ability of the system to function properly. Problems may result from the methods used to operate the system and from parts failures. Malfunction of leak detection and leachate collection system components may develop gradually over time or occur suddenly. Minor problems are those that can typically be corrected quickly by making operational adjustments, or simple repairs that result in little to no system down-time. Significant problems, however, may require termination of the leak detection and leachate collection system operation until the problem is corrected. Only those problems that are typically encountered are presented. A thorough knowledge of leak detection and leachate collection systems is necessary to respond to all potential situations.

4.4.2 Collection Piping

The primary operational concern regarding the collection piping system is siltation which can limit the amount of drainage.

4.4.3 Collection Pumps

Routine monitoring will indicate that collection pumps are operating properly. Potential operating problems and remedies are described as follows:

- Pipe and fittings may loosen or fail during operation and allow leachate to leak into the secondary containment system. If any piece of equipment fails to function properly, or has shifted position due to differential settlement, the materials will be repaired or replaced.

Maintenance and repairs of the collection pumps will be made as identified during routine inspections based on manufacturer's recommendations. Refer to Appendix ?? for the O&M manuals supplied by the manufacturers of the pumps for additional information.

4.4.3.1 Electrical and Controls. The electrical service to the CAMU leachate extraction system extends from the ??? to the CAMU service entrance near the ???. Operational problems are not anticipated for the electrical service. Control system components will periodically fail and will require replacement. The control systems will be maintained routinely as recommended by the manufacturer.

4.4.4 Troubleshooting

At times, the leak detection and leachate collection systems will react to situations which were not previously recognized. The operator must determine the cause of the reaction and decide how to remedy the problem.

Important tools in troubleshooting are the monitoring instruments. After checking instrument operation and calibration, recheck all of the symptoms to make sure a number was not misread or the problem corrected itself. For situations not covered below, refer to Appendix ?? for additional O&M information provided by the manufacturers.

<u>Problem</u>	<u>Investigation/Procedure</u>
Loss of flow at sump pump	<ul style="list-style-type: none">• Check upstream and downstream for large pressure change to indicate location of liquid blockage.
Pump failure	<ul style="list-style-type: none">• Check water level switches• Check control system and electrical services

4.5 CORRECTIVE ACTION

Implement corrective actions in the event that the performance and compliance standards are not being met during leak detection and leachate collection system operation. The standards established for the leak detection and leachate collection systems include:

- Allow dewatering of dredged sediments by providing a continuous bottom drainage way.
- Remove leachate from the CAMU to reduce the risk of groundwater impact.
- Monitor the integrity of the primary geomembrane using the leak detection system.

If the leak detection and leachate collection system design performance, or compliance standards are not being met during operation and system equipment problems are responsible, take response measures as described in previous sections of this O&M Plan.

If the system, and its components, are functioning properly and standards are not being met, corrective action must be taken. The following corrective actions are discussed as related to specific design standards.

4.5.1 Description of Corrective Actions

4.5.1.1 Freezing Leachate. If operations of any leak detection and leachate collection system component fails to function as a result of freezing leachate, corrective measures must be taken. Measures include the installation of insulation and may include heat trace wire. System locations that may likely have leachate freeze are exposed piping, including the pipe connection manholes and collection manhole inlet and outlet.

4.5.2 Implementation Schedule

In the event leachate levels rise above one foot following initial passive dewatering, the response must be made with respect to the risk. The actual action and schedule of response should be determined based on the investigation findings.

4.5.3 General Safety Precautions

4.5.3.1 Leachate Safety. Leachate may be an irritant when in contact with the skin and precautions must be taken:

- Wear chemical resistant gloves when handling leachate covered materials.
- If leachate is splashed on exposed skin, wash the affected area with fresh water, as soon as possible.
- In the event leachate spray enters a person's eyes, flush the eyes immediately with cool water, for a minimum of 15 minutes, and contact a physician.
- Use proper personal protective equipment if leachate or leachate spray could be encountered. When working in the presence of leachate, it is important to use the proper level of protection.
- Refer to the Site Safety Plan for additional information. O&M personnel should read this document.

4.6 RECORDS AND REPORTING

4.6.1 Daily Operating Logs

A daily operation log must be maintained for the leak detection and leachate collection systems in a suitable on-site location and accessible during site visits. A suitable location

may be within the an on-site storage or maintenance building. This log must report at a minimum the following information:

- Date and time of data entry
- Operational status of the system
- Details regarding any system faults or alarms
- Maintenance performed
- Noted system deficiencies requiring action

A daily log form is included in Appendix ?? for use by O&M personnel.

4.6.2 Laboratory Records

A copy of all analytical results related to the leak detection and leachate collection systems must be maintained in a suitable on-site location and accessible during site visits. A suitable location may be within an on-site storage or maintenance building. Required analytical testing is described in previous sections of this O&M Plan. Refer to Appendix ?? and ?? for subcontracted laboratories information.

4.6.3 Operating Costs Documentation

A copy of operating costs accrued related to the leak detection and leachate collection systems must be maintained in a suitable on-site location and accessible during site visits. A suitable location may be within an on-site storage or maintenance building. The costs documented should include:

- System components repaired or replaced
- Monitoring equipment purchased, repaired, or replaced
- Investigations
- Corrective actions
- Routine monitoring and O&M
- Sampling and testing
- All labor including that which was subcontracted

4.6.4 Personnel Records

The staff present during monitoring and O&M activities must be identified on the applicable forms prepared for documenting project activities. The forms are included in Appendix ??.

4.6.5 Maintenance Records

A copy of all records related to maintenance of the leak detection and leachate collection systems must be kept on-site in an accessible location for reference. A suitable location may be within an on-site storage or maintenance building. The records must indicate what action was taken, by whom, and cost of maintenance or repairs. A maintenance record form is included in Appendix ?? for use by O&M personnel.

4.6.6 Reporting Emergencies

Emergencies that result during monitoring and O&M of the leak detection and leachate collection systems should be handled as described in the Site Safety Plan. A list of responsible project personnel and an Emergency Reporting Reference Sheet are included in Appendix ??. This sheet provides the basic information necessary to respond to project emergencies. This sheet should be placed at several locations on-site for ease of reference.

4.6.7 Notification of Temporary Shut Down

If for any reason the leachate extraction system is interrupted or stopped for a period greater than 24 hours the Agencies will be notified within 48 hours of the shutdown. The Agencies must be notified by telephone, which must be confirmed in writing within five days after the date of the telephone notification. The Agencies must be notified of the nature and cause of the interruption or cessation of operation, as well as the estimated length of time before operation of the system will resume.

4.6.8 Reporting to USEPA

Progress reports must be issued to the Agencies on a semi-annual basis. All monitoring, O&M, analytical testing results, and associated information must be reported to the Agencies for the previous six months of operation.

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5.0 STORM WATER MANAGEMENT SYSTEM

Storm water will be managed in a way such that erosion of the berms and roadways is minimized.

5.1 STORM WATER MANAGEMENT SYSTEM OPERATION

Storm water control during operation of the CAMU will be limited to the storm water run off from the perimeter berms' outboard sideslopes only. The storm water flow off the outboard slope of the perimeter berm will be directed to the four corners of the property by grading shallow ditches between the toe of slope and the perimeter access roads and allowing storm water to infiltrate.

5.1.1 Theory of Operation

The purpose of storm water management controls at the CAMU site during operation is to prevent erosion, prevent sediment/particles from flowing into the GCR without being filtered appropriately, and prevent large amounts of water flowing into the GCR without constructing diversions to lessen the flowrate from a storm event. This allows a gradual, slower flowrate and diminishes flooding and large surges of water to the GCR.

Two infiltration basins will be constructed to handle storm water flow from final site conditions of the CAMU. The purpose of the infiltration basins is to filter out sediment from storm water and gradually allow the large amount of storm water from the CAMU to flow into the swale which ultimately discharges into the GCR.

5.1.2 Storm Water Management System Description

Permanent storm water management after operation of the CAMU and closure of the CAMU will consist of intermediate swales on the final cover slopes, downslope pipes discharging to storm water manholes, storm water pipe connecting the manholes, and discharge to two infiltration basins. The intermediate swales on the cover slopes will be graded to direct storm water to eight downslope pipes located within the cover system. The downslope pipes will consist of a buried pipe to direct the collected storm water down the finished slopes to manholes constructed within the perimeter berms. Eight storm water manholes will be located on the perimeter berm.

During operation of the CAMU site, storm water that falls into the CAMU will be managed by the dewatering system. Refer to Section 2.0. Thus, storm water control during operation of the CAMU will be limited to the storm water run-off from the perimeter berms' outboard sideslopes only. The storm water flow off the outboard slope of the perimeter berm will be directed to the four corners of the property by grading shallow ditches between the toe of slope and the perimeter access roads. In addition the berms'

outboard sideslopes will be covered with 6 inches of topsoil, erosion control matting, and will be seeded.

The two infiltration basins will be constructed on the CAMU area to handle storm water from final conditions. One basin is located at the northeast corner of the CAMU area, and the other is located at the southwest corner of the CAMU area. These basins were sized using a 25-year, 6-hour storm event. Emergency overflow structures and discharge piping for the infiltration basins are designed to handle greater storm events. The overflow discharge piping gravity drains to the shallow ditch located south of the southern roadway. From there, the storm water flows south under the Indiana Tollway through an existing box culvert structure located south of the CAMU's southeast corner which discharges into a swale located 300 ft southeast of the GCR.

5.2 NORMAL OPERATION, MAINTENANCE, AND MONITORING

5.2.1 System Operation

The storm water management control operations are based on the design of the controls and are not automatically or manually operated. During operation of the CAMU, ditches will direct storm water flow to each corner of the CAMU from the outboard berm and allowed to infiltrate. Additionally, silt fencing will be placed around the CAMU site and in areas where a high level of erosion may occur (i.e., dirt roads). All roads providing access to the CAMU should be inspected periodically.

Two infiltration basins were constructed to handle storm water flow from final conditions of the CAMU. Additionally, final cover of the CAMU has been designed accordingly with intermediate and perimeter swales to handle storm water flow from a storm event. Storm water from the swales flow through storm water manholes located on the bermed road which ultimately flows to one of the infiltration basins. The infiltration basins are constructed with emergency overflow structures that allows storm water to flow out of the basins before overfilling occurs.

5.2.2 System Maintenance

Periodic maintenance of any system is required to keep it running efficiently. During operation of the CAMU, ditches and the outboard berms of the CAMU should be inspected weekly to ensure erosion has not occurred. Additionally, all silt fencing and dirt roads should be inspected weekly during construction and active operation.

Storm water manholes and piping to the infiltration basins should be periodically inspected during a storm event to check the pipes are not clogged below the surface. Additionally, the emergency overflow structures and grate should be periodically inspected to check that they are working properly in the event the infiltration basins can not handle a storm event.

5.2.3 Storm Water Monitoring

Monitoring will be based on visual inspections of discharge storm water areas to help maintain the integrity of the outfalls. Corrective measures will be taken if monitored outfalls show depletion of integrity.

5.3 O&M SCHEDULE

The following O&M and Monitoring Schedule indicates the O&M, monitoring, and sampling activities that are necessary to successfully run the storm water control system.

- Inspect monthly drainage swales, infiltration basin, and culverts for the deposition of sediment and other debris that would hinder the flow of water. Remove and appropriately dispose of such materials, if found.
- Remove sediment from infiltration basins annually.
- Inspect ditches for deposition of sediment and other debris or deterioration for storm water flow monthly during operation of the CAMU.
- Inspect silt fences weekly or after major storm events during construction and until vegetation is established.
- Inspect storm water manholes on perimeter berms monthly and remove debris as appropriate.

5.4 POTENTIAL OPERATION PROBLEMS

5.4.1 Description and Analyses

Potential problems that may occur with the storm water control system include clogging of piping from the storm water manholes, and clogging of the infiltration basins emergency spillway.

5.4.2 Troubleshooting

Troubleshooting of the storm water management system involves cleaning of sediment build-up in piping and infiltration basins.

5.5 CORRECTIVE ACTION

5.5.1 Description of Corrective Actions

Implement corrective actions in the event that the performance of the storm water control system is not working properly. Corrective actions may include:

- Cleaning of debris and sediment buildup from downslope pipes, catch basins, and the emergency overflow structure.
- Replace silt fencing as needed or add in areas where needed.

5.5.2 Implementation Schedule

All areas of concern found during the inspection should be fixed as soon as possible after discovery.

5.5.3 General Safety Precautions

Confined spaces entry precautions must be followed in the event that entrance into the storm water manholes is required. Additionally, caution should be taken if entering the infiltration basin with standing water.

5.6 RECORDS AND REPORTING

5.6.1 Daily Operating Logs

No operating logs will be required for the storm water control system. However, inspection forms should be kept in a suitable on-site location and accessible during site visits. At a minimum, the inspection form should contain the following information:

- Date and time of inspection
- Signature of person conducting the inspection
- Location the inspection is taken place
- Observations of erosion and sediment controls
- Maintenance performed
- Noted system deficiencies requiring action

5.6.2 Laboratory Records

A copy of all analytical results, if any, relating to the storm water control system must be maintained on-site in a suitable location and be accessible during site visits.

5.6.3 Operating Costs Documentation

A copy of operating costs accrued related to the storm water control system must be maintained in a suitable on-site location and accessible during site visits. A suitable location may be within an on-site storage or maintenance building. The costs documented should include:

- System components repaired or replaced
- Monitoring equipment purchased, repaired, or replaced
- Investigations
- Corrective actions
- Routine monitoring and O&M
- Sampling and testing
- All labor including that was subcontracted

5.6.4 Personnel Records

The staff present during monitoring and O&M activities must be identified on the applicable forms prepared for documenting project activities. The forms are included in Appendix ??.

5.6.5 Maintenance Records

A copy of all records related to maintenance of the CAMU liner system must be kept on-site in an accessible location for reference. A suitable location may be within an on-site storage or maintenance building. The records must indicate what action was taken, by whom, and cost of maintenance or repairs.

5.6.6 Reporting Emergencies

Emergencies that result during monitoring and O&M of the CAMU storm water management system should be handled as described in the Site Safety Plan included in Appendix ??. A list of responsible project personnel and an Emergency Reporting

Reference Sheet are included in Appendix ???. This sheet provides the basic information necessary to respond to project emergencies. This sheet should be placed at several locations on-site for ease of reference.

5.6.7 Notification of Temporary Shut-Down

The infiltration basins are gravity fed. Therefore, shut down is not applicable.

5.6.8 Reporting to USEPA

Progress reports must be issued to the Agencies on a semi-annual basis. All monitoring, O&M, analytical testing results, and associated information must be reported to the Agencies for the previous six months of operation.

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6.0 CAMU LINER SYSTEM

The CAMU liner system consists of geosynthetics. Operation within the CAMU will be such so as not to compromise the integrity of the multi-layer liner system.

6.1 CAMU LINER SYSTEM OPERATION

Once installed the CAMU liner system will provide protection to the surrounding environment by providing a relatively impermeable barrier beneath the dredged spoils. Thus, reducing the infiltration of leachate generated within the dredged spoils. The liner system consists of from the top to the bottom of the following:

- primary 60-mil HDPE geomembrane
- leak detection geonet geocomposite
- secondary 60-mil HDPE geomembrane
- geosynthetic clay liner

The liner system does not have any operational parts. Once it is installed it should operate as designed.

6.2 PRECAUTIONS WHILE OPERATING IN AND AROUND THE CAMU

Since the liner system is relatively thin. Care must be taken to operate within and around the CAMU with out damaging the geosynthetics. The following lists those precautions to be followed:

- Do not allow any sharp objects to be placed in contact with the geosynthetics.
- Do not allow any stakes or anchor poles to be installed within the perimeter or interior berms that may puncture the geosynthetics and/or the runout length of the geosynthetics.
- Do not allow any objects to fall on the geosynthetics.
- Do not place dredge spoils directly on the geosynthetics. A protective layer must be in place above the geosynthetics on both the sidewalls and the base.

- Do not operate the equipment barge within 50 ft of the sidewalls. Do not allow the barge or other equipment within the CAMU to run into the geosynthetics on the sidewalls.
- Do not place dredge spoils directly on the sidewalls, as they may slough down the sidewall, pulling the geosynthetics with it as it settles.

6.3 CORRECTIVE ACTION

6.3.1 Description of Corrective Actions

Implementation of corrective actions for damage to the CAMU geosynthetic liner will not be easy to perform. Avoid damaging the geosynthetics at all times. If corrective actions are necessary, they may include the following:

- Expose the area of the geosynthetics that was damaged and repair in accordance with the project specifications.
- Remove any dredge spoils in the vicinity of the damaged area.

6.3.2 Implementation Schedule

Any area damaged should be fixed as soon as possible.

6.3.3 General Safety Precautions

Precautions should be taken around the top of berm so as not to fall into the CAMU when it is empty or full.

6.4 RECORDS AND REPORTING

6.4.1 Daily Operating Logs

No operating logs will be required for the CAMU liner system. However, inspection forms should be kept in a suitable on-site location and accessible during site visits. At a minimum, the inspection form should have the following information:

- Date and time of inspection
- Signature of person conducting the inspection
- Location the inspection is taken place

- Observations of erosion and sediment controls
- Maintenance performed
- Noted system deficiencies requiring action

6.4.2 Operating Costs Documentation

A copy of operating costs accrued related to the CAMU liner system must be maintained in a suitable on-site location and accessible during site visits. A suitable location may be within an on-site storage or maintenance building. The costs documented should include:

- System components repaired or replaced
- Monitoring equipment purchased, repaired, or replaced
- Investigations
- Corrective actions
- Routine monitoring and O&M
- Sampling and testing
- All labor including that was subcontracted

6.4.3 Personnel Records

The staff present during monitoring and O&M activities must be identified on the applicable forms prepared for documenting project activities. The forms are included in Appendix ??.

6.4.4 Maintenance Records

A copy of all records related to maintenance of the CAMU liner system must be kept on-site in an accessible location for reference. A suitable location may be within an on-site storage or maintenance building. The records must indicate what action was taken, by whom, and cost of maintenance or repairs.

6.4.5 Reporting Emergencies

Emergencies that result during monitoring and O&M of the CAMU liner system should be handled as described in the Site Safety Plan included in Appendix ??. A list of responsible project personnel and an Emergency Reporting Reference Sheet are included in

Appendix ?? This sheet provides the basic information necessary to respond to project emergencies. This sheet should be placed at several locations on-site for ease of reference.

6.4.6 Notification of Temporary Shut-Down

If damage to the liner results in the interruption of CAMU operations for a period greater than 24 hours the Agencies will be notified within 48 hours of the shutdown. The Agencies must be notified by telephone, which must be confirmed in writing within five days after the date of the telephone notification. The Agencies must be notified of the nature and cause of the interruption or cessation of operations, as well as the estimated length of time before operation of the system will resume.

6.4.7 Reporting to USEPA

Progress reports must be issued to the Agencies on a semi-annual basis. All monitoring, O&M, analytical testing results, and associated information must be reported to the Agencies for the previous six months of operation.

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HEALTH AND SAFETY PLAN



Site Safety Plan

Construction/Operation Level Design Report Corrective Action Management Unit Grand Calumet River Sediment Remediation Project

**U.S. Steel - Gary Works
Gary, Indiana**

*Prepared for
U.S. Steel Group
Pittsburgh, Pennsylvania*

October 2000

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LIST OF APPENDICES

Appendix

- A - Safety Checklists
- B - Chemical Hazard Summary Information
- C - Site Maps
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SITE SAFETY PLAN (SSP)

SSP REVIEW SIGNATURES

Health and Safety: _____

Date: _____

Project Manager: _____

Date: _____

KEY PERSONNEL

Site Manager: To be determined

Alternate: To be determined

Site Safety Officer: To be determined

Alternate: To be determined

PROPOSED PROJECT START DATE

To be determined.

This Site Safety Plan does not supersede or in any way relieve subcontractors of their obligations under any applicable OSHA regulations including 29 CFR 1910: Occupational Safety and Health Standards and 29 CFR 1926: Health and Safety Regulations for Construction.

Personnel working at this site meet the training and medical monitoring requirements of 29 CFR 1910.120: Hazardous Waste Operations and Emergency Response. Documentation of this training and medical surveillance can be obtained upon written request to the site, Health and Safety Coordinator.

The health and safety procedures set forth in this Site Safety Plan (SSP) are based on the site conditions and chemical hazards known or expected to be present using site data available at the time this SSP was written. This SSP is intended solely for the use of Personnel during the activities described in this SSP. This SSP is subject to review and revision by Health and Safety Manager (HSM) or designated alternate when it is deemed necessary by actual Site conditions encountered during the field activities.

1.0 SITE SAFETY OFFICER (SSO) RESPONSIBILITIES

The Site Safety Officer (SSO) is responsible for field implementation of this SSP and enforcement of safety rules and regulations. The SSO will handle liaison with subcontractors on matters relating to health and safety. Other site-specific SSO functions include:

- Verify that utility clearance has been performed.
- Oversee day-to-day implementation of the SSP by subcontractor employees.
- Interact with subcontractor project personnel on health and safety matters.
- Determine levels of protection.
- Provide “refresher” training to new site personnel and subcontractor site personnel on health and safety matters.
- Verify that site personnel and subcontractor site personnel have received proper training and participate in a medical surveillance program.
- Inspect and maintain (daily) safety equipment which includes calibration of air monitoring instrumentation.
- Perform or direct ambient air quality monitoring as warranted.
- Modify SSP as needed and notify appropriate persons of changes.
- Investigate and report on-site accidents/incidents.
- If construction quality assurance personnel enter excavations, act as the competent person and ensure OSHA excavation requirements are enacted.
- Verify that construction quality assurance personnel and subcontractor site personnel are familiar with the hospital route, and that the route map is posted in the work trailer or site vehicles.
- Establish detailed procedures and routes for evacuation from the site.
- Establish the Exclusion, Decontamination and Support Zones at the site, as necessary, and provide means of securing the work area.
- Implement and direct confined space entry procedures if under the scope of work.

The SSO will hold initial startup and daily safety briefings with site personnel staff and subcontractors. The SSO will use the comprehensive and daily checklists found in Appendix A when conducting the briefings.

The SSO will report accidents such as injury, overexposure, or property damage to the HSM, and will consult with the HSM on specific health and safety issues arising over the course of the project.

2.0 SITE DESCRIPTION/HAZARD SUMMARY

2.1 SUMMARY OF HAZARDS KNOWN OR SUSPECTED TO BE PRESENT

- Corrosive materials
- Heavy metals
- Inorganic materials
- Organic materials
- Toxic materials
- Hydrogen cyanide
- Hydrogen sulfide
- PCBs
- Vinyl chloride
- Temperature stress
- Heavy equipment operation
- Severe weather

2.2 SITE OVERVIEW

The U.S. Steel - Gary Works facility is located in Lake County, Indiana. The Gary Works facility covers almost 4,000 acres and is located at the northern end of the City of Gary, Indiana and is approximately 25 miles southeast of downtown Chicago, Illinois. The Gary Works facility extends approximately 7 miles along the southern shore of Lake Michigan and is roughly 1 mile wide.

The Corrective Action Management Unit (CAMU) area to be used for disposal is approximately 36.2 acres and is located within the U.S. Steel – Gary Works Facility. The CAMU consists of two Units: Unit 1 is for the TSCA and RCRA regulated non-native dredge spoils and Unit 2 will hold the remaining non-TSCA and RCRA dredge spoils. Unit 1 is approximately 7.0 acres and Unit 2 is approximately 29.2 acres.

The Site is an undeveloped property approximately 55 acres in size. During dredging of the Grand Calumet River approximately 30 years ago, dredged materials were spread in the bermed area on the site.

2.3 SCOPE OF WORK SUMMARY

The Scope of Work for construction of the CAMU consists of the following general activities.

- Well installation
- CAMU construction activities

2.4 SCOPE OF WORK

The objectives of the CAMU design and construction, as stated in the Statement of Work, is to provide containment and passive dewatering of dredged sediments as part of the Grand Calumet River Sediment Remediation Project. Proper containment requires installation of the dewatering system (including the vertical barrier wall), site fence, CAMU excavation and berm construction, on-site road construction, installation of the CAMU liner (and associated protection), installation of the leak detection/leachate collection systems, and installation of the storm water management system. The proposed CAMU liner system is a completely synthetic liner system consisting of a: geosynthetic clay liner (GCL), secondary 60-mil high density polyethylene (HDPE) geomembrane, leak detection system (geonet composite and collection pipe), primary 60-mil HDPE geomembrane, and leachate collection system (geotextile cushion, sidewall geonet composite, and collection pipe). Protection for the geosynthetic liner system consists of a combination of geosynthetics and native granular material over entire CAMU site. The CAMU construction activities associated with the Grand Calumet River Sediment Remediation Project are briefly summarized as follows:

2.4.1 Vertical Barrier Wall

Installation of the vertical barrier wall will consist of the following activities:

- Initial clearing and grubbing of site.
- Removal of existing dredge spoils in the area of the working bench.
- Construction of the barrier wall working bench.
- Excavation of 2-ft wide, 50 ft deep trench for placement of the bentonite slurry to construct the wall.
- Capping the constructed vertical barrier wall with a clay cap.

2.4.2 Dewatering System

- Installation of 6-in. diameter vertical extraction wells (EW02 through EW07).
- Installation of 2-in. diameter temporary stand pipes (SP01 through SP03).
- Installation of horizontal, underground dewatering system forcemain piping.
- Installation of the groundwater collection manhole (MHGW).

- Installation of the groundwater discharge pipe to Outfall 032 and pipe connection manhole (MH03).

2.4.3 Site Security

- Installation of the permanent security fencing, gates, and warning signs around the entire site.

2.4.4 CAMU Excavation

- Final clearing and grubbing of site.
- Removal of the existing dredge spoils at berm locations and temporarily stockpile away from berms.
- Installation of the GCL at berm locations.
- Construction of the perimeter and interior berms.
- Excavation of the CAMU to the design base grades.
- Preparation of the base grade surface for GCL installation.

2.4.5 Berm Construction

- Construction of berms will occur using the temporarily stockpiled existing dredge spoils.
- Excavation of the remaining existing dredge spoils and complete berm construction with existing dredge spoils and native sand material.
- Reinforcement of the inboard slopes of perimeter berms where necessary, with geogrid.
- Construction of the infiltration basins.

2.4.6 Road Construction

- Construction of the perimeter roads.
- Following liner installation, construction of the top of berm roads and access roads into the excavation.

2.4.7 Liner System

- Placement of the GCL over prepared base grades and extension up the entire slope.
- Placement of the secondary geomembrane over GCL.
- Placement of the geonet composite over secondary geomembrane.
- Placement of the primary geomembrane over geonet composite.
- Placement of the geotextile cushion on base and sidewall geonet composite over primary geomembrane.

2.4.8 Leak Detection/Leachate Collection System

- Installation of the underground leak detection and leachate collection pipes in trenches.
- Construction of the leak detection and leachate collection system within the liner system.
- Installation of the leak detection and leachate collection system forcemains.
- Installation of the leachate collection manholes (MH01 and MH02).
- Installation of the leachate discharge line to PSWTP.
- Placement of the granular drainage blanket layer.
- Placement of the sidewall protection layer.

2.5 CHEMICAL HAZARD SUMMARY

<u>Matrix</u>	<u>Compound</u>	<u>Max. Conc. Expected</u>	<u>Location</u>
Soil	VOCs	unknown	investigation area
Soil	SVOCs	unknown	investigation area
Soil	Pest/PCBs	unknown	investigation area
Soil	Metals	unknown	investigation area
Groundwater	VOCs	unknown	investigation area
Groundwater	SVOCs	unknown	investigation area
Groundwater	Pest/PCBs	unknown	investigation area
Groundwater	Metals	unknown	investigation area

Note: Chemicals of concern are generally unknown. Any contaminants that could be associated with the sludge materials should be expected.

Chemical hazard summary sheets are included in Appendix B.

3.0 SITE BOUNDARIES AND ENTRANCE/EXIT

3.1 SITE AND PROJECT BOUNDARIES

See Appendix C which contains a map of the site indicating boundaries of the site and project activity locations. Investigation area consists of bermed area as shown on map.

3.2 PRESENT SITE SECURITY

U.S. Steel provides security and maintains a record of all personnel entering and exiting the Gary Works facility. The CAMU area presently has no security measures.

3.3 SITE SECURITY UPGRADES NEEDED

During initial stays of site construction a permanent security fence consisting of 6-ft high chain link fence with 3-strand barbed wire will be installed. Other areas not already fenced will be marked with yellow caution tape to prevent unauthorized entry into the work area.

Security will be maintained by verbal commands. No unauthorized individuals are allowed within 20 feet of operations.

3.4 ZONES OF CONTAMINATION

Zone boundaries do not need to be marked. Generally, the area within 20 feet of the site of field operations is considered the Exclusion Zone.

3.5 ENTRY RESTRICTIONS

All personnel must check in at the U.S. Steel main guard house. Personnel must notify U.S. Steel a minimum of 24 hours prior to site visit. Guard house personnel must be notified by other U.S. Steel personnel prior to visit.

3.6 ENTRANCE TO BE USED

Follow Grant Street north (exit off East-West Tollway) to frontage road west to site located between Canal and Railroad Yard (see Hospital Route Map).

3.7 CHECK-IN REQUIRED

All personnel entering or leaving the site must register with the guard located off frontage road at Grant Street U.S. Steel entrance.

3.8 WORK HOURS

Dawn to dusk (no work permitted after dark unless proper lighting is provided).

3.9 WORK DAYS

Normal work days will be Monday through Friday. Saturday and/or Sundays may also be worked depending on the construction schedule.

4.0 GENERAL SITE HEALTH AND SAFETY CONSIDERATIONS

4.1 WEATHER CONDITION RESTRICTIONS

The Site Safety Officer (SSO) has the authority, should severe weather threaten, to place site activities on standby, cease operations and/or evacuate the site as deemed necessary.

Weather conditions on site can not be controlled. Site personnel are to be aware of the warnings of impending severe weather and the precautions that are to be taken when severe weather threatens. Refer to the SOP for Severe Weather found in Appendix D.

4.2 TEMPERATURE STRESS

Hot or cold weather is generally a consideration at any site and can not be controlled. Site workers need to be aware of engineering controls which can reduce temperature stress, the signs and symptoms of temperatures stress and first aid measures for victims of temperature stress. Refer to the SOP for Temperature Stress found in Appendix E.

4.3 GENERAL SITE HEALTH AND SAFETY RULES

Some general safe work practices apply to all sites. Refer to the SOP for General Site Health and Safety Rules found in Appendix F.

4.4 HEAVY EQUIPMENT

Special safety procedures are required when working around heavy equipment. Heavy equipment may include, but are not limited to, drill rigs, bulldozers, backhoes, scrapers, loaders, and trucks. Contractors are responsible that their employees are properly trained to operate heavy equipment.

All self-propelled construction equipment shall be equipped with reverse signal alarms and with rollover protection. Additionally, seat belts shall be worn when operating heavy equipment. All self-propelled construction equipment used on site will be inspected and operated in accordance to EM 385-1-1 Sec. 16, and with the requirements of the manufacturer.

Potential hazards associated with earthwork include exposure to physical hazards associated with heavy equipment. Hazards associated with operating heavy equipment include obstructed view, moving parts, rollover, overhead clearance, noise and dust. The following safety precautions will be utilized when site activities utilize heavy equipment:

- Only trained and qualified personnel shall be permitted to operate heavy equipment.
- No tools, personal clothing, water jugs, or lunch boxes shall be stored on or in heavy operating equipment. The operator's personal artifacts are permitted only and must be secured in the cab of the equipment.
- Each backhoe, excavator, grader, drill rig, or other similar equipment shall be equipped with at least one dry chemical fire extinguisher with a minimum rating of 5-B:C.
- Work areas will be arranged as to minimize the backing of heavy equipment and trucks. Heavy equipment and trucks will have operational reverse signal alarms.
- A spotter should be used when backing up to avoid blind spots.
- Equipment will be inspected daily by the equipment operator.
- Personnel working on the equipment or in the area should wear safety glasses with side shields, steel-toe steel-shank safety boots, hard hats, and brightly colored traffic safety vests for visibility.
- Personnel will stay out of the operating envelope/swing radius of heavy operating equipment and shall not walk under or work over suspended loads. Personnel will maintain eye or verbal contact with operators.
- Work areas and roadways will be kept free of dust that could temporary obstruction of vision.
- Equipment left unattended at night, adjacent to a roadway or adjacent to construction areas where work is in progress shall have lights, or reflectors, or barricades equipped with lights
- Equipment with tall booms should, at a minimum, remain at least 10 ft from overhead power lines and should not be moved with the boom raised.
- Do not perform any repair or maintenance to the machine unless the engine is off and the machinery is blocked against motion where a potentially hazardous situation exists.

4.5 TRAFFIC

If personnel will be in a roadway or within 10 ft of a roadway during work activities, orange safety vests must be worn. Barricades and warning signs and/or cones may be

required. The SSO will determine if additional measures are warranted and will implement necessary control measures. Follow the procedures in Appendix F - General Site Health and Safety Rules.

4.6 BIOLOGICAL HAZARDS

There is a potential for additional hazards at the site which include biological hazards.

- **Biological -** Occupationally induced infection can occur in any occupation as a result of exposure to bacteria, viruses, fungi, or parasites. A simple laceration from a sharp edge can become secondarily infected with staphylococci or streptococci. A thorn, a wood splinter, or a metal slug acting as a foreign body can pave the way for secondary infection of the skin. Cuts, scrapes, or other lacerations should be cleaned, disinfected, and dressed immediately following standard first aid procedures.
- **Plants -** A broad variety of plants and wood cause injury to skin through primary irritation or allergic sensitization. Although the chemical identity of many plant toxins has not been established, it is well known that an irritant or allergenic agent can be present in the leaves, stems, flowers, bark, and other components of the plant. Examples include, poison ivy and sumac. Personnel will be wearing long pants at the site. If work is to be performed in areas with poison ivy or sumac, contact with the plant should be avoided. The SSO will identify locations where poisonous plants are present during daily site briefings. Personnel may need to wear gloves or chemical resistant clothing (Tyvek). If contact is made with poison plants, remove contaminated clothing, wash all exposed areas with soap and water followed by rubbing alcohol. Apply calamine or other soothing skin location. Seek medial advice if severe reaction occurs.
- **Insects -** Insect bites and stings can be serious to hypersensitive persons and even deadly depending on the type of insect. Examples include bees, wasps, hornets, brown recluse spiders, and ticks. Lyme disease is a tick-borne disease and starts out with flu-like symptoms but may lead to arthritis and serious nerve and heart damage. Avoid tall grassy areas or other areas of thick vegetation. If work is performed in these areas, personnel should wear light colored clothing, tape pant's cuffs around their ankles, use a commercially available repellent and check for ticks regularly.
- **Animals -** Animal bites are a concern because of the potential for the animal to carry the rabies virus, which attacks the nervous system. If an animal bite occurs the victim must be taken to the nearest medical facility immediately.

4.7 EXCAVATIONS

Operations at the site will include excavating trenches and drilling 36-in. diameter boreholes. A backhoe or other remote means will be used to collect samples. Excavations will be barricaded or filled in at the end of the day by the SSO to prevent unauthorized entry into the excavations.

Operations at the site will include possible entry into excavations. Confined space entry procedures will be implemented according to Appendix J before entry into excavations over 4 ft deep. The SSO will act as the competent person and inspect all excavations to ensure they are safe before personnel are allowed to enter. Sloping, shoring or bracing will be used to prevent sidewall collapse in excavations over 5 ft deep. Work will be conducted according to Appendix K - Excavation SOP.

4.8 UTILITIES

All utilities must be cleared before performing any intrusive activities. The SSO will verify that utilities have been cleared before work begins at the site.

4.9 NOISE

Hearing protection is required when working in close proximity to heavy equipment, the level of noise interferes with communications or the sound level exceeds 85 dB. Generally, if you cannot hear someone speaking at a normal conversational level when they are 3 ft from you, you need hearing protection. **Hearing protection is required within 50 ft of the following operations:**

- Driving casing
- During core drilling
- Use of power tools
- Use of air compressor
- Use of other machinery

4.10 CONFINED SPACES

Confined space entry is not allowed under the scope of this SSP. Should a confined space entry situation be encountered, the Health and Safety Manager must be notified and provisions for confined space entry must be added to this SSP. The proper safety procedures will be implemented according to Appendix J before entry into a confined space.

4.11 FALL HAZARDS

If work is performed on an elevated level six (6) feet above the ground or work surface or on steep slopes, fall protection is required. Fall protection may still be necessary for heights less than six feet in certain situation if there is a potential for injury from falls at lower heights. These may include falls onto protruding rebar or other sharp objects. The SSO will be responsible for implementing the fall protection program as outlined in Appendix F - General Site Health and Safety Rules. Ladders also pose a significant hazard associated with falls. The guidelines in Appendix F should also be used if ladders are present at the site.

4.12 WATER HAZARDS

Workers working near water, where a danger of drowning exists will wear U.S. Coast Guard approved life jackets. The SSO will inspect life jackets before and after each use. Defective life jackets will be taken out of service and destroyed. When working from boats or barges ring buoys with at least 90 feet of line will be available for emergency rescue. A lifesaving skiff will be available when working from barges for rescue purposes.

4.13 ELECTRICAL HAZARDS

4.13.1 Electrical Cords

Electrical cords passing through work areas should be covered or elevated to protect the cord from damage and reduce hazards to employees.

Extension cords used with portable tools will be 3-wire type and will be protected from damage when in use. Extension cords must be inspected on a routine basis. Cords with cuts in the insulation or that are worn or frayed or have insulation pulled back from the plug or receptacle fittings will be taken out of service immediately.

4.13.2 Grounding

Portable tools and other electric equipment will be grounded or double insulated. Ground fault circuit interrupters (GFCIs) will be used in wet areas and on all field sites and outdoor operations. Extension cords used on site must always be used in conjunction with GFCIs.

4.14 HOT WORK

Hot work involves the use of open flames or other sources of heat around possible sources of flammable vapors.

Hot work is not permitted under the scope of this SSP.

The SSO will be responsible for fire control measures as outlined in Appendix F - General Site Health and Safety Rules.

4.15 LIFTING/MATERIALS HANDLING

Lifting and materials handling are hazardous during operations. Follow the procedures outlined in Appendix F - General Site Health and Safety Rules when lifting objects or handling materials.

5.0 CHEMICAL HAZARD EVALUATION/AIR MONITORING STRATEGY

The following air quality parameters will be monitored during work activities:

- Oxygen Level
- Combustible Gases
- Hydrogen Sulfide
- Hydrogen Cyanide
- Volatile Organic Compounds (VOCs)

MSDS equivalents for specific compounds noted above are included in Appendix B. Refer to Appendix J for confined space entry procedures.

5.1 AIR MONITORING STRATEGY

5.1.1 Oxygen

A direct reading oxygen meter will be used to determine the percent of oxygen in the atmosphere.

<u>Instrument Reading</u>	<u>Action to be Taken</u>
<19.5% or >23.5%	Cease operations and move to a safe area. Re-evaluate the work plan. Engineering controls such as forced ventilation and use of non-sparking tools are to be implemented if operations are to continue. DO NOT CONTINUE WORKING UNTIL OXYGEN LEVELS ARE BETWEEN 19.5 AND 23.5%. When oxygen levels are outside this range, combustible gas meter readings are not reliable.

5.1.2 Combustible Gases

Action levels are based on the readings of a combustible gas meter. The readings are generally given as a percentage of the lower explosion limit (% LEL).

<u>Instrument Reading</u>	<u>Action to be Taken</u>
0 to 20% LEL	Continue working and monitoring the atmosphere for combustible gases. Inform personnel working in the area whenever readings are >10% LEL.

20 to 40% LEL Continue working with caution. Inform personnel working in the area of the readings. Be prepared to cease operations.

>40% LEL Cease operations and move to a safe area. Re-evaluate the work plan. Engineering controls such as forced ventilation and use of non-sparking tools are to be implemented if operations are to continue. **DO NOT CONTINUE WORKING UNTIL CONDITIONS ARE CONSISTENTLY BELOW 40% LEL.**

NOTE

When oxygen levels are above 23.5% or below 19.5%, combustible gas meter readings are not reliable.

5.1.3 Hydrogen Sulfide (H_2S)

A direct reading H_2S meter will be used to determine H_2S levels. Whenever the alarm sounds on the H_2S meter, cease work immediately and contact the SSO or HSM. For H_2S the TLV is 10 PPM, and the alarm is set for 10 PPM.

If approval is given by the SSO or Health and Safety Manager, verification of the presence of H_2S is to be made using colorimetric tubes which can detect H_2S . The person taking the sample is to wear appropriate respiratory protection. There is no air-purifying cartridge approved for use in an atmosphere containing H_2S . A supplied-air respirator must be used.

If the presence of H_2S is confirmed, cease activities and contact the HSM. If the colorimetric tubes do not indicate the presence of H_2S , continue with site activities cautiously and continue to monitor for H_2S with the direct reading meter.

5.1.4 Hydrogen Cyanide (HCN)

A direct reading HCN meter will be used to determine HCN levels. Whenever there is any positive reading on the HCN meter, cease work immediately and contact the Site Safety Officer (SSO) or Health and Safety Manager. The TLV-C (ceiling) for HCN is 4.7 PPM, and the alarm is set for 4 PPM.

If approval is given by the SSO or Health and Safety Manager, verification of the presence of HCN is to be made using colorimetric tubes which can detect HCN. The person taking the sample is to wear appropriate respiratory protection. There is no air-purifying cartridge approved for use in an atmosphere containing HCN. A supplied-air respiratory must be used.

If the presence of HCN is confirmed, cease activities and contact the Health and Safety Manager. If the colorimetric tubes do not indicate the presence of HCN, continue with site activities cautiously and continue to monitor for HCN with the direct reading meter.

5.1.5 Volatile Organic Compounds (VOCs)

Equipment:

Photoionization meter with a lamp rating of 11.7 eV

Action Levels:

< Background: Level D or D-Modified*

< 5 Instrument Units above background: Level C

5 to 50 Instrument Units above background: Level B

≥ 50 Instrument Units above background: Cease operations and move to a safe area.
Contact the Health and Safety Manager and re-evaluate the work plan.

5.1.6 Dust

Dust generation during site activities is anticipated dust suppressants and water will be used to limit dust generation.

5.2 FREQUENCY

Perform air monitoring whenever any of the following situations arise:

- Upon initial entry to a site to rule out IDLH conditions
- Work begins at a different portion of the site
- New contaminants are noted
- A new/different phase of work is started
- Work is being performed in areas with obvious liquid contamination
- Intrusive activities
- Continuously during confined space entry

Monitoring should be performed on personnel with the highest potential exposure. If samples are being collected in jars, use monitoring equipment to determine the level of contaminants in the breathing zone of the person collecting the samples. Do not use instantaneous readings to determine the level of protection. Readings should be persistent unless “pulses” of vapor exceed STEL or Ceiling levels. Monitoring should also be

performed at the source of chemical hazards such as boreholes and the surface of contaminated materials but upgrades are based on breathing zone concentrations.

5.3 CALIBRATION REQUIREMENTS

Calibrate all monitoring equipment at the beginning and end of each work day.

Calibration data will be recorded in a bound field notebook or in the field notes. Documentation should include:

- Date/time
- Zero reading before calibration
- Concentration of calibration gas
- Reading obtained with calibration gas before adjusting span
- Final reading obtained with calibration gas after adjusting span

When air monitoring is required, take area air samples at the following locations daily. Record time, location and results of monitoring and actions taken based upon the readings:

- Upwind of work areas to establish background air contaminants
- In Support Zone to check for contamination
- Along decontamination line to check that decontamination workers are properly protected and on-site workers are not removing protective equipment in a contaminated area
- Exclusion Zone to verify level of protection and Exclusion Zone boundaries
- Downwind of work area to track any contaminants leaving site

Use the SOPs for equipment calibration.

5.4 REQUIRED PERSONAL PROTECTIVE EQUIPMENT

5.4.1 Level D

- Work Uniform
- Safety Boots - Steel toe/steel shank
- Hard Hat
- Safety Glasses with side shields*
- Face Shield*
- Hearing Protection*

5.4.2 Level D-Modified

- Safety Boots - Steel toe/steel shank
- Hard Hat
- Safety Glasses with side shields*
- Face Shield*
- Hearing Protection*
- Outer Gloves - neoprene or nitrile
- Boot Covers - latex
- Chemical Resistant Clothing - Polycoated Tyvek
- Inner Gloves - nitrile

5.4.3 Level C

- Safety Boots - Steel toe/steel shank
- Hard Hat
- Face Shield*
- Hearing Protection*
- Outer Gloves - neoprene or nitrile
- Boot Covers - latex
- Chemical Resistant Clothing - Polycoated Tyvek
- Full-Face Air Purifying Respirator
- Respirator Cartridge - GMC-H
- Inner Gloves - nitrile

5.4.4 Level B

- Safety Boots - Steel toe/steel shank
- Hard Hat
- Face Shield*
- Hearing Protection*
- Outer Gloves - neoprene or nitrile
- Boot Covers - latex
- Chemical Resistant Clothing - Polycoated Tyvek
- Positive Pressure/Pressure Demand Self Contained Breathing Apparatus or Airline Respirator with Escape Bottle
- Inner Gloves - nitrile

* Optional PPE - Use as needed.

Note: Safety glasses are required within 50 ft of operating equipment, tools or machinery. Face shields are required during operations that may cause materials to fly into or spray the face. These include:

- Sawing metal or concrete
- Grinding or sanding operations
- In the vicinity of drilling operations when mud and liquids are sprayed in the work area
- When opening drums or tanks when hazardous materials under pressure are potentially present
- Cutting with a torch or when welding

5.5 TASK SPECIFIC LEVELS OF PROTECTION

Tasks include:

- Soil borings/Well installation
- Vertical barrier wall installation
- Dewatering system installation
- Security fencing, gate, and sign installation
- CAMU excavation
- Berm construction
- Road construction
- Liner system placement
- Leak detection/Leachate collection system installation

All tasks are Entry-Level D. Upgrade to Level D-modified or C based on field readings (PID, etc.)

5.6 ROUTINE DECONTAMINATION

Use the SOP for Decontamination at the highest level of protection used on site each day, found in Appendix G.

6.0 EMERGENCY INFORMATION

	<u>Address</u>	<u>Telephone</u>	<u>Contact Person</u>
Ambulance		911 or *999	
Hospital E/R	U.S. Steel Dispensary Bldg #527 on U.S. Steel Property (See Hospital Map for Location)		
Poison Control	Chicago	(800) 942-5969	
Police	Gary Police	911 or *999 (Cellular phone)	
Fire	Gary Fire	911 or *999 (Cellular phone)	
Client	Rick Menozzi U.S. Steel 600 Grant Street, Room 2287 Pittsburgh, PA 15219-2749		
Utilities	Identified by CAMU Operating Contractor		
Chemtrec		800-424-9300	

Note: When using a mobile telephone, *999 only works on State Highways. Otherwise, dial '0' for operator assistance to direct you to the appropriate emergency services.

<u>Emergency Contacts</u>	<u>Name</u>	<u>Business Phone</u>
Project Manager	To Be Determined	
Site Manager	To Be Determined	
H&S Coordinator	To Be Determined	
H&S Manager	To Be Determined	

6.1 EMERGENCY ROUTES

See Appendix C for a map showing the route to the hospital/clinic.

6.1.1 Driving Directions

From CAMU Area, follow frontage road east to Grant Street. Right (south) on Grant Street to 5th Avenue. Left (east) on 5th Avenue to Broadway. Left (north) on Broadway to U.S. Steel Entrance. U.S. Steel Dispensary is on south side of Canal east of U.S. Steel Entrance (Guard @ U.S. Steel entrance can direct you exactly to the Dispensary.)

Emergency routes are to be verified by the SSO and communicated to site personnel prior to site activities.

6.2 EMERGENCY PROCEDURES

6.2.1 Emergency Equipment

Staff should have a standard first aid kit and 5 lb ABC fire extinguisher at the site.

6.2.2 Emergency Decontamination

Refer to the SOP for Emergency Decontamination found in Appendix G.

6.2.3 Site Evacuation

The evacuation signal for the site is three short blasts of a horn, either on a motor vehicle or an air horn. Evacuation routes and assembly points are to be determined at the site. All site workers are to be notified of routes and assembly points by the SSO during the daily safety meetings. Refer to the SOP for Emergency Response found in Appendix H for more details on site evacuation.

6.2.4 First Aid

Refer to the SOP for Chemical First Aid found in Appendix I for general chemical first aid procedures. Standard first and CPR procedures should be used in other medical emergencies. Each first aid kit contains protection equipment that must be worn while performing first aid and CPR. This includes:

- Disposable gloves
- Disposable mouth-to-mouth resuscitator
- Safety goggles/face mask
- Disposable overgarment

Whenever first aid procedures are performed on another person, the Health and Safety Manager must be notified immediately.

7.0 NAMES AND SIGNATURES

All personnel working on or visiting this site are to sign below, indicating that they have read this Site Safety Plan (SSP), understand its contents, have been given opportunity to discuss its contents with the Site Safety Officer (SSO) and agree to abide by its requirements.

The supervisors of all subcontractors are to sign below, indicating that they have read this Site Safety Plan (SSP), understand its contents, and have been given opportunity to discuss its contents with the Site Safety Officer (SSO).

<u>Date</u>	<u>Name</u>	<u>Employer</u>	<u>Signature</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
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_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

It is the responsibility of the Site Safety Officer (SSO) to have a completed and signed copy of this SSP returned to the project file.

M:\jobs\1242\330\01\wp\rpt\90_Text SSP.doc

A

SAFETY CHECKLISTS

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Provisions of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discriminatory action.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to \$1,000 for each serious violation and for optional penalties of up to \$1,000 for each nonserious violation. Penalties of up to \$1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to \$10,000 for each such violation.

There are also provisions for criminal penalties. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of up to \$250,000 (or \$500,000 if the employer is a corporation), or by imprisonment for up to six months, or both. A second conviction of an employer doubles the possible term of imprisonment.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

OSHA has published Safety and Health Program Management Guidelines to assist employers in establishing or perfecting programs to prevent or control employee exposure to workplace hazards. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free assistance in identifying and correcting hazards and in improving safety and health management is available to employers, without citation or penalty, through OSHA-supported programs in each State. These programs are usually administered by the State Labor or Health department or a State university.

Posting Instructions

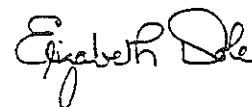
Employers in States operating OSHA approved State Plans should obtain and post the State's equivalent poster.

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or facsimile) in a conspicuous place where notices to employees are customarily posted.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta	(404) 347-3573
Boston	(617) 565-7164
Chicago	(312) 353-2220
Dallas	(214) 767-4731
Denver	(303) 844-3061
Kansas	(816) 426-5861
New York	(212) 337-2325
Philadelphia	(215) 596-1201
San Francisco	(415) 995-5672



Elizabeth Dole, Secretary of Labor

U.S. Department of Labor

Occupational Safety and Health Administration

Washington, D.C.
1989 (Revised)
OSHA 2203



SITE HEALTH AND SAFETY CHECKLIST - COMPREHENSIVE

GENERAL INFORMATION

Date: _____ Checklist completed by: _____
Project number: _____ Project name: _____
Location: _____
Site Manager: _____ Site Safety Officer: _____
Weather: ☐ windy ☐ fair ☐ cloudy ☐ dry ☐ rain ☐ sleet
☐ snow temperature _____ °C/°F

SAFETY INFORMATION

☐ Yes ☐ No ☐ N/A Signed SSP on-site:
☐ available ☐ posted
☐ Yes ☐ No ☐ N/A SSP reviewed and signed by necessary personnel.

☐ Yes ☐ No ☐ N/A MSDSs on site for all hazardous materials brought to site by
personnel.
☐ available ☐ posted

☐ Yes ☐ No ☐ N/A Designated SSO present.

☐ Yes ☐ No ☐ N/A Site safety briefing held.
Date of last briefing: ____ / ____ / ____

On-site personnel meet OSHA requirements for:

☐ Yes ☐ No ☐ N/A • H&S training
☐ Yes ☐ No ☐ N/A • Medical surveillance
☐ Yes ☐ No ☐ N/A • Respirator fit test

On-site Subcontractors meet OSHA requirements for:

☐ Yes ☐ No ☐ N/A • H&S training
☐ Yes ☐ No ☐ N/A • Medical surveillance
☐ Yes ☐ No ☐ N/A • Respirator fit test
☐ Yes ☐ No ☐ N/A Work being done in compliance with SSP and SOPs.

☐ Yes ☐ No ☐ N/A Equipment specified in SSP available.
☐ Yes ☐ No ☐ N/A Equipment specified in SSP in working order.
☐ Yes ☐ No ☐ N/A Equipment manuals available.
☐ Yes ☐ No ☐ N/A Monitoring equipment calibrated.
☐ Yes ☐ No ☐ N/A Calibration records available.
☐ Yes ☐ No ☐ N/A Responsible personnel know how to operate monitoring
equipment.

- ☐ Yes ☐ No ☐ N/A Adequate equipment/materials inventory available.
- ☐ Yes ☐ No ☐ N/A Radiation monitoring badges being worn by all personnel working with nuclear density gauges.
- ☐ Yes ☐ No ☐ N/A Zones established and enforced:
- ☐ Yes ☐ No ☐ N/A • Exclusion
 - ☐ Yes ☐ No ☐ N/A • Decontamination
 - ☐ Yes ☐ No ☐ N/A • Support/clean
- ☐ Yes ☐ No ☐ N/A Proper decontamination procedures:
- ☐ Yes ☐ No ☐ N/A • Set up
 - ☐ Yes ☐ No ☐ N/A • Enforced
- ☐ Yes ☐ No ☐ N/A Emergency telephone numbers posted.
- ☐ Yes ☐ No ☐ N/A Emergency route to hospital posted.
- ☐ Yes ☐ No ☐ N/A Local officials notified.
- ☐ Yes ☐ No ☐ N/A At least one person on-site has current first aid and CPR certification.
- ☐ Yes ☐ No ☐ N/A Appropriate first aid materials on site:
- ☐ Yes ☐ No ☐ N/A • 15 minute eye wash
 - ☐ Yes ☐ No ☐ N/A • First aid kit
- ☐ Yes ☐ No ☐ N/A Special emergency procedures implemented.

SAFETY EQUIPMENT UTILIZED BY FIELD CREW

- ☐ Yes ☐ No ☐ N/A Field/Health and Safety Equipment Checklists complete and current.

COMMENTS

Effectiveness of SSP: _____

Deficiencies noted: _____

Remedial actions required/taken: _____

HEALTH AND SAFETY MEETING ATTENDANCE

<u>Date</u>	<u>Name</u>	<u>Employer</u>	<u>Signature</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
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_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

SITE HEALTH AND SAFETY CHECKLIST - DAILY

Date: _____ Checklist completed by: _____
Project number: _____ Project name: _____
Location: _____
Site Manager: _____ Site Safety Officer: _____
Weather: ☐ windy ☐ fair ☐ cloudy ☐ dry ☐ rain ☐ sleet
☐ snow temperature: _____ ° / °

Topic covered?

- | | |
|---|--|
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Site hazards |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • General site health and safety hazards |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Specific hazards associated with substances of concern |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Routes of exposure |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Specific hazards associated with a task/job |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Physical stresses/hazards |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Buddy" system |
| | |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Site Safety Plan |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Role/duties of Site Safety Officer (SSO) |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Ambient air monitoring |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Emergency procedures/hospital routes |
| | |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Personal Protection |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Required PPE |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • SCBA/Air-supplying respirator review |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Proper donning/doffing techniques |
| | |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | Decontamination |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Overview of station(s) |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Proper techniques |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Field equipment decontamination |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Heavy equipment/machinery decontamination |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Vehicle movement |
| <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | • Personal hygiene |

[illegible]

Name

Employer

Signature

[illegible]

Page 2 of 2

EXCAVATION SAFETY CHECKLIST

(This form is to be completed daily.)

Project: _____ Project #: _____

Competent Person: _____ Date: _____

Utilities Checked

_____ Telephone	_____ Sewer
_____ Electric	_____ Cable TV
_____ Natural Gas	_____ Other
_____ Water	

Secure Surface & Overhead Structures

_____ Power Poles	_____ Buildings/Foundations
_____ Overhead Obstacles	_____ Sidewalks
_____ Roads	_____ Other

Trench Depth

_____ 0-5' _____ 5'-10' _____ 10'-15' _____ 15'-20' _____ >20'

Egress

Ladder Present in Trench _____ Yes _____ No

(Ladder required at trench depths of 4' or greater)

(Ladder to extend 36" above ground surface)

(Ladder or ramp within 25' of linear travel in either direction)

Soil Classification

Visual Analysis of Soil

_____ Cracks/Fissures/Spalling of Trench Sides
_____ Water Seeping From Sides or Bottom
_____ Different Soil in Layers
_____ Soil Previously Disturbed
_____ Underground Utilities Present
_____ Continuous Vibration Present

Penetrometer Reading: _____

	<u>A</u>	<u>B</u>	<u>C</u>
Penetrometer Reading	≥ 1.5 tsf	1.5-0.5 tsf	<0.5 tsf
Not Previously	Previously	Previously	
Disturbed	Disturbed	Disturbed	
Stable Dry	Cracks	Seeping Soil	
Rock	Fissures	Wet Soil	
Maximum Slope	53 deg. (3/4:1)	45 deg. (1:1)	34 deg. (1-1/2:1)

Vehicular Traffic

Area Properly Barricaded ☐ Yes ☐ No

Reflective Clothing Worn ☐ Yes ☐ No

Flagman Present as Necessary ☐ Yes ☐ No

Protective System in Place to
Prevent Vehicles Unloading Fill
Materials From Backing into
Excavation ☐ Yes ☐ No

Other Hazards

Check for Hazardous Atmospheres
☐ Oxygen ☐ Combustibles ☐ Organic Vapors ☐ Other

Confined Space Permit Acquired ☐ Yes ☐ No

Excavated materials and
equipment at least 2 feet from
edge of excavation and no other
overhead hazards to personnel
in excavation ☐ Yes ☐ No

Water removed from excavation ☐ Yes ☐ No

Ramps, Walkways, Bridges over
Excavations Equipped
with Handrails ☐ Yes ☐ No

Shoring System Designed by
Professional Engineer ☐ Yes ☐ No

Excavations Barricaded or
Filled in at End of Day ☐ Yes ☐ No

B

CHEMICAL HAZARD SUMMARY INFORMATION

4,4'-DDD

CAS #:	72-54-8	ACGIH TLV:	no data
MOL. WT:	320.04	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: Cream colored, crystalline solid
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	no data
Melting Point:	230 F 110 C	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	<1 mg/ml @18 C	Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause pollution.

SYMPTOMS OF OVEREXPOSURE

Ingestion causes vomiting and delayed symptoms similar to those caused by DDT. Contact with eyes causes irritation.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Removal of solidified molten material from skin requires medical attention. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; watch victim.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

ACENAPHTHENE

CAS #: 83-32-9
MOL. WT: 154.21
CONC IDLH: no data
NIOSH REL: no data

ACGIH TLV: no data
ACGIH STEL: no data
OSHA PEL: no data

DESCRIPTION

Physical: crystals
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	531.2 F	277.3 C	Vapor Pressure:	no data
Melting Point:	204.8 F	96 C	Ionization Potential:	no data
Flash Point:	no data		Upper Explosion Limit:	no data
Solubility:	insoluble in water		Lower Explosion Limit:	no data

INCOMPATIBILITIES: Strong Oxidants

ROUTES OF EXPOSURE

Target Organs: Skin, eyes, mucous membranes, resp tract
Health Hazards: Contact may cause burns to skin and eyes
Fire may produce irritating or poisonous gases
Runoff from fire control or dilution water may cause pollution

SYMPTOMS OF OVEREXPOSURE

No data

FIRST AID

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

ACETONE

CAS #:	67-64-1	ACGIH TLV:	750 ppm
MOL. WT:	58.08	ACGIH STEL:	1000 ppm
CONC IDLH:	20000 ppm	OSHA PEL:	1000 ppm
NIOSH REL:	250 ppm		

DESCRIPTION

Physical: Colorless liquid with fragrant, mint-like odor
Odor: residual; ketonic, pleasant, non-residual
Odor Threshold: 100 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	133 F	56.1 C	Vapor Pressure:	196 mm @ 21 C
Melting Point:	-137.7 F	-94.3 C	Ionization Potential:	6.87 to 7.19
Flash Point:	1.3 F	-17.05 C	Upper Explosion Limit:	12.80%
Solubility:	miscible		Lower Explosion Limit:	2.60%

INCOMPATIBILITIES: Ox, Acids

ROUTES OF EXPOSURE

Target Organs: Respiratory system, skin, eyes, CNS
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation: Vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations
Ingestion: Low order of toxicity but very irritating to mucous membranes
Skin: Prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis

FIRST AID

Move victim to fresh air and call emergency medical care. If breathing is difficult, administer artificial respiration or oxygen. For skin contact, wash well with water. For eyes, flush with water immediately for at least 15 minutes, and call a physician. Seek immediate medical attention if ingested; induce vomiting if victim is conscious and has swallowed large amounts.

NFPA RATINGS

Health Hazard (Blue): (1)slightly hazardous to health; wear self-contained breathing apparatus as a precaution
Flammability (Red): (3)can be ignited under almost all temperature conditions
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

ACETOPHENONE

CAS #:	98-86-2	ACGIH TLV:	no data
MOL. WT:	120.15	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: colorless liquid with a flowery, sweet odor; forms crystals at low temp
Odor: jasmine
Odor Threshold: 0.01-0.025 mg/M3

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	396.5 F 202.5 C	Vapor Pressure:	no data
Melting Point:	67.5 F 19.7 C	Ionization Potential:	8.6
Flash Point:	179.3 F 81.85 C	Upper Explosion Limit:	no data
Solubility:	slightly soluble	Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control may cause pollution.

SYMPTOMS OF OVEREXPOSURE

No toxicity expected from inhalation or ingestion except slight narcotic effect. Liquid can cause eye and skin irritation on contact.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (1)slightly hazardous to health; wear self-contained breathing apparatus as a precaution
Flammability (Red): (2)material must be moderately heated before ignition will occur
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

ARSENIC

CAS #:	7440-38-2	ACGIH TLV:	0.2 mg/M3
MOL. WT:	299.69	ACGIH STEL:	no data
CONC IDLH:	100 mg/M3	OSHA PEL:	0.01 mg/M3
NIOSH REL:	0.002 mg/M3		

DESCRIPTION

Physical: silvery to black, brittle; grey, shiny, metallic looking; crystalline and amorphous metalloid

Odor: garlic

Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	1138.7 F 614.8 C	Vapor Pressure:	1mm @ 372 C
Melting Point:	1496.9 F 813.8 C	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	insoluble	Lower Explosion Limit:	no data

INCOMPATIBILITIES: Oxidizers, acids; bromine oxide, dirubidium acetylide, halogens, palladium, zinc, platinum, nitrogen trichloride, silver nitrate, chromium trioxide, sodium peroxide

ROUTES OF EXPOSURE

Target Organs: no data

Health Hazards: Poisonous if swallowed. Inhalation of dust poisonous.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water by cause pollution.

SYMPTOMS OF OVEREXPOSURE

Nausea, vomiting, diarrhea, death.

FIRST AID

Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue):	no data
Flammability (Red):	no data
Reactivity (Yellow):	no data
Special:	no data

BARIUM

CAS #:	7440-39-3	ACGIH TLV:	no data
MOL. WT:	137.34	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: Silver-white, slightly lustrous, somewhat malleable metal.
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	2983.7 F 1639.8 C	Vapor Pressure:	10 mm @ 1049 C
Melting Point:	1336.7 F 724.8 C	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	decomposes	Lower Explosion Limit:	no data

INCOMPATIBILITIES: Water, oxidizing agents, oxygen, acids, chlorinated solvents.

ROUTES OF EXPOSURE

Target Organs: Skin, eyes
Health Hazards: May be poisonous if inhaled.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.

SYMPTOMS OF OVEREXPOSURE

Dermatitis, depilation, vertigo, nausea, vomiting, colic, diarrhea, rapid respiration, hypertension, irregular heart action, cyanosis, muscular weakness, tremor, lumbar pain, convulsion, paralysis.

FIRST AID

Move victim to fresh air; call emergency medical care. Wipe material from skin immediately; flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

BENZENE

CAS #:	71-43-2	ACGIH TLV:	10 ppm
MOL. WT:	78.11	ACGIH STEL:	susp. human carcinogen
CONC IDLH:	3000 ppm	OSHA PEL:	TWA 1 ppm;
NIOSH REL:	.1 ppm		STEL 5 ppm

DESCRIPTION

Physical: Colorless to pale yellow watery liquid with a gasoline-like odor
Odor: gasoline-like
Odor Threshold: 4.68 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	176 F	80 C	Vapor Pressure:	75 mm @ 20 C
Melting Point:	42 F	5.5 C	Ionization Potential:	9.25
Flash Point:	11.9 F	-11.15 C	Upper Explosion Limit:	7.1%
Solubility:	0.06%		Lower Explosion Limit:	1.3%

INCOMPATIBILITIES: Strong ox, chlorine, bromine with iron

ROUTES OF EXPOSURE

Target Organs: Blood, CNS, skin, bone marrow, eyes, resp sys
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Dizziness, excitation, pallor followed by flushing, weakness, headache, breathlessness, chest constriction.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NEPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (3)material can be ignited under almost all temperature conditions
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

BENZYL ALCOHOL

CAS #:	100-51-6	ACGIH TLV:	no data
MOL. WT:	108.15	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: Colorless, water white liquid with a mild, pleasant odor and sharp burning taste

Odor: mild, pleasant

Odor Threshold: 5.5 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	401.9 F	205.5 C	Vapor Pressure:	1 mm @ 58 C
Melting Point:	4.1 F	-15.5 C	Ionization Potential:	no data
Flash Point:	211.7 F	99.85 C	Upper Explosion Limit:	no data
Solubility:	0.08/100 pts		Lower Explosion Limit:	no data

INCOMPATIBILITIES: Acids, acid chlorides, acid anhydrides, oxidizers, plastics

ROUTES OF EXPOSURE

Target Organs: Skin, eyes

Health Hazards: no data

SYMPTOMS OF OVEREXPOSURE

Inhalation of vapor may cause irritation of upper respiratory tract. Prolonged or excessive inhalation may result in headache, nausea, vomiting and diarrhea. In severe cases, respiratory stimulation followed by respiratory and muscular paralysis, convulsions, narcosis and death may result. Ingestion may produce severe irritation of the gastrointestinal tract, followed by nausea, vomiting, cramps and diarrhea; tissue ulceration may result. Contact with eyes causes local irritation. Material can be absorbed through skin with anesthetic or irritant effect.

FIRST AID

Inhalation: Remove victim from contaminated atmosphere; call physician immediately.

Ingestion: Induce vomiting and contact a physician.

Eyes: Flush with plenty of water for at least 15 minutes and contact a physician.

Skin: Flush with water, wash with soap and water; obtain medical attention in case of irritation or central nervous system depression.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus

Flammability (Red): (1)material must be preheated before ignition can occur

Reactivity (Yellow): (0)stable even under fire conditions

Special: no data

2-BUTANONE

CAS #:	78-93-3	ACGIH TLV:	200 ppm
MOL. WT:	72.12	ACGIH STEL:	300 ppm
CONC IDLH:	3000 ppm	OSHA PEL:	200 ppm
NIOSH REL:	200 ppm		

DESCRIPTION

Physical: Clear colorless liquid with a fragrant, mint-like moderately sharp odor
Odor: like acetone; pleasant; pungent
Odor Threshold: 10 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	175.2 F	79.5 C	Vapor Pressure:	71.2 mm @ 20 C
Melting Point:	-123 F	-86.2 C	Ionization Potential:	6.7
Flash Point:	21.6 F	-5.75 C	Upper Explosion Limit:	11.5%
Solubility:	27%		Lower Explosion Limit:	1.8%

INCOMPATIBILITIES: Very strong oxidizers, chlorosulfonic acid, oleum, potassium-tert-butoxide, heat or flame, chloroform, hydrogen peroxide, nitric acid

ROUTES OF EXPOSURE

Target Organs: CNS, lungs, peripheral nervous system; eyes at 350 ppm.
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Liquid causes eye burn. Vapor irritates eyes, nose and throat; can cause headache, dizziness, nausea, weakness and loss of consciousness.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (1) slightly hazardous to health; wear self-contained breathing apparatus as a precaution
Flammability (Red): (3) material can be ignited under almost all temperature conditions
Reactivity (Yellow): (0) stable even under fire conditions
Special: no data

CADMIUM

CAS #:	7440-43-9	ACGIH TLV:	0.05 mg/M3
MOL. WT:	112.30	ACGIH STEL:	no data
CONC IDLH:	50 mg/M3 (dust) 9 mg/M3 (fume)	OSHA PEL:	5 ug/M3
NIOSH REL:	0.01 mg/M3		

DESCRIPTION

Physical:	Soft, blue-white, malleable, lustrous metal; grayish-white powder.
Odor:	no data
Odor Threshold:	no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	1412.3 F 766.8 C	Vapor Pressure:	no data
Melting Point:	609.3 F 320.7 C	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	insoluble	Lower Explosion Limit:	no data

INCOMPATIBILITIES: Strong ox, elemental sulfur, selenium, tellurium

ROUTES OF EXPOSURE

Target Organs:	Resp sys, lungs, kidneys, prostate, blood
Health Hazards:	Contact may cause burns to skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Pulm edema, syys, cough, tight chest, subs pain; head chills, muscle ache, nau, diar anosmia, emphy, prteinuria, anemia.

FIRST AID

For eyes, immediately flush with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at site.

NFPA RATINGS

Health Hazard (Blue):	no data
Flammability (Red):	no data
Reactivity (Yellow):	no data
Special:	no data

PORTLAND CEMENT

CAS #:	65997-15-1	ACGIH TLV:	10 mg/ M3
MOL. WT:	variable	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	15 mg/M3 (total dust)
NIOSH REL:	no data		

DESCRIPTION

Physical: odorless, gray powder with <1% crystalline silica
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	about 0 mm
Melting Point:	no data	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	insoluable	Lower Explosion Limit:	no data

INCOMPATIBILITIES: none hazardous

ROUTES OF EXPOSURE

Target Organs: resp sys, eyes, skin
Health Hazards: no data

SYMPTOMS OF OVEREXPOSURE

Irrit eyes, nose, cough, wheeze, chron bron, derm, expectionation, exertional dysp

FIRST AID

Move victim to fresh air and call emergency medical care. If material was ingested, drink water and vomit. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

NEPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

CHLOROETHANE

CAS #:	75-00-3	ACGIH TLV:	1,000 ppm
MOL. WT:	64.52	ACGIH STEL:	1,250 ppm
CONC IDLH:	20,000 ppm	OSHA PEL:	1000 ppm
NIOSH REL:	pot. occup. carcinogen		

DESCRIPTION

Physical: Colorless liquid or gas with a pungent, ether-like odor
Odor: ether-like
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	54 F	12.2 C	Vapor Pressure:	1064 mm
Melting Point:	-218 F	-138.9 C	Ionization Potential:	10.97
Flash Point:	-58.3 F	-50.15 C	Upper Explosion Limit:	15.4%
Solubility:	soluble in 0.574 g/100ml		Lower Explosion Limit:	3.8%

INCOMPATIBILITIES: Chemically active metals: sodium, potassium, calcium, powdered aluminum, zinc, magnesium

ROUTES OF EXPOSURE

Target Organs: Skin, eyes, mucous membrane, liver, kidneys, resp sys, cardiovascular system

Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Vapor causes drunkenness, anesthesia, possible lung injury. Liquid may cause frostbite on eyes and skin.

FIRST AID

Move victim to fresh air, keep warm and quiet and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. For eyes, immediately flush with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate clothing and shoes at the site. Treat frostbite.

NFPA RATINGS

Health Hazard (Blue):	(2)hazardous to health; wear self-contained breathing apparatus to enter area
Flammability (Red):	(4)material forms readily ignitable mixtures in air
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

CHLOROFORM

CAS #:	67-66-3	ACGIH TLV:	10 ppm
MOL. WT:	119.38	ACGIH STEL:	no data
CONC IDLH:	1000 ppm	OSHA PEL:	50 ppm
NIOSH REL:	2 ppm / 9.78 mg/M3		

DESCRIPTION

Physical: clear, colorless mobile liquid with a characteristic odor
Odor: pleasant, sweet, ethereal
Odor Threshold: 205 - 307 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	140.9 F 60.5 C	Vapor Pressure:	160 mm
Melting Point:	-81.4 F -63 C	Ionization Potential:	11.42
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	0.8%	Lower Explosion Limit:	no data

INCOMPATIBILITIES: strong caustics, chemically active metals such as aluminum, magnesium powder, sodium, potassium

ROUTES OF EXPOSURE

Target Organs: liver, kidneys, heart, eyes, skin, CNS
Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin.
Contact may cause burns to skin and eyes.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.
Fire may produce irritating or poisonous gases.

SYMPTOMS OF OVEREXPOSURE

Headache, nausea, dizziness, drunkenness, narcosis.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. For skin or eyes, immediately flush with running water for at least 15 minutes. Speed in removing clothing from skin is of extreme importance. Wash skin with soap and water and isolate contaminated clothing and shoes at the site. Keep victim quiet and warm. Effects may be delayed; watch victim.

NFPA RATINGS

Health Hazard (Blue):	(2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red):	(0)material does not readily burn
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

CHROMIUM

CAS #:	7440-47-3	ACGIH TLV:	0.5 mg/M3
MOL. WT:	51.996	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	1 mg/M3
NIOSH REL:	no data		

DESCRIPTION

Physical: Steel-gray metal or silver metal powder
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	4787.3 F 2641.8 C	Vapor Pressure:	no data
Melting Point:	3451.7 F 1899.8	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	no data	Lower Explosion Limit:	no data

INCOMPATIBILITIES: Strong oxidizers

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: Contact may cause burns to skin and eyes
Fire may produce irritating or poisonous gases
Runoff from fire control or dilution water may cause pollution

SYMPTOMS OF OVEREXPOSURE

Histologic fibrosis of lungs

FIRST AID

In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing at site.

NEPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

COBALT

CAS #:	7440-48-4	ACGIH TLV:	0.05 mg/M3
MOL. WT:	58.93	ACGIH STEL:	metal dust & fume as cobalt
CONC IDLH:	no data	OSHA PEL:	0.1 mg/M3
NIOSH REL:	0.1 mg/M3		

DESCRIPTION

Physical: Gray, hard, magnetic, ductile, somewhat malleable metal
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	5612 F 3100 C	Vapor Pressure:	no data
Melting Point:	2721.2 F 1494 C	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	no data	Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: no data

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

no data

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

CYANIDE (inorganic)

CAS #:	57-12-5	ACGIH TLV:	5 mg/M3
MOL. WT:	no data	ACGIH STEL:	as cyanide - skin
CONC IDLH:	50 mg/M3	OSHA PEL:	5 mg/M3
NIOSH REL:	4.7 ppm / 5 mg/M3		

DESCRIPTION

Physical: no data
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	-412.9 F -247.2 C	Vapor Pressure:	no data
Melting Point:	no data	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	no data	Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; watch victim.

NEPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

DDT

CAS #:	50-29-3	ACGIH TLV:	1 mg/M3
MOL. WT:	354.48	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	1 mg/M3
NIOSH REL:	0.5 mg/M3		

DESCRIPTION

Physical: Pure DDT is a colorless, white or slightly off-white powder. Technical grade DDT is a white or cream colored waxy solid. Available as powders, granules, aerosols, smoke candles, emulsifiable concentrates and vaporizer charges. May be dissolved in a hydrocarbon.

Odor: no data

Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	low
Melting Point:	228 F 108.8 C	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	0.00001%	Lower Explosion Limit:	no data

INCOMPATIBILITIES: Stong Ox

ROUTES OF EXPOSURE

Target Organs: CNS, kidneys, liver, skin, pns, gi tract, lungs

Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin.

Contact may cause burns to skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Very large doses are followed promptly by vomiting, due to local gastric irritation; delayed emesis or diarrhea may occur. With smaller doses, symptoms usually appear 2-3 hours after ingestion. These include tingling of lips, tongue and face; malaise, headache, sore throat, fatigue, coarse tremors of neck, head and eyelids; apprehension, ataxia and confusion. Convulsions may alternate with periods of coma and partial paralysis. Vital signs are essentially normal but in severe poisoning the pulse may be irregular and abnormally slow; ventricular fibrillation and sudden death may occur at any time during acute phase. Pulmonary edema usually indicates solvent intoxication.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artifical respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; watch victim.

NFPA RATINGS

Health Hazard (Blue): no data Reactivity (Yellow): no data

Flammability (Red): no data

Special: no data

1,2-DICHLOROETHYLENE

CAS #:	540-59-0	ACGIH TLV:	200 ppm / 790 mg/M3
MOL. WT:	96.94	ACGIH STEL:	250 ppm / 1000 mg/M3
CONC IDLH:	4000 ppm	OSHA PEL:	200 ppm / 790 mg/M3
NIOSH REL:	no data		

DESCRIPTION

Physical: Colorless liquid with an ether-like, slightly acrid odor like chloroform
Odor: pleasant, ether-like
Odor Threshold: 0.085 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	-256.3 F -160.2 C	Vapor Pressure:	180 mm
Melting Point:	0 F -17.8 C	Ionization Potential:	9.65
Flash Point:	35.3 F 1.85 C	Upper Explosion Limit:	12.8%
Solubility:	0.35 to 0.63%	Lower Explosion Limit:	9.7%

INCOMPATIBILITIES: Strong oxidizers, nitrogen dioxide, solid caustic alkalis or their concentrated solutions; difluoromethylene, dehydrofluoritei

ROUTES OF EXPOSURE

Target Organs: Resp sys, eyes, CNS
Health Hazards: May be poisonous if inhaled.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation causes nausea, vomiting, weakness, tremor, epigastric cramps, central nervous system depression. Contact with liquid causes irritation of eyes, and on prolonged contact, skin. Ingestion causes slight depression to deep narcosis.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (3)material can be ignited under almost all temperature conditions
Reactivity (Yellow): (2)normally unstable and readily undergoes violent change, but does not detonate
Special: no data

p-DICHLOROBENZENE

CAS #:	106-46-7	ACGIH TLV:	75 ppm
MOL. WT:	147.00	ACGIH STEL:	110 ppm
CONC IDLH:	1000 ppm	OSHA PEL:	75 ppm / 450 mg/M3
NIOSH REL:	potential occupational carcinogen		

DESCRIPTION

Physical: Colorless to white crystals with a mothball-like odor
Odor: aromatic, like mothballs
Odor Threshold: 15 - 30 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	345 F	173.8 C	Vapor Pressure:	0.4mm @ 25 C
Melting Point:	127 F	52.7 C	Ionization Potential:	8.94
Flash Point:	148.7 F	64.85 C	Upper Explosion Limit:	no data
Solubility:	0.008%		Lower Explosion Limit:	no data

INCOMPATIBILITIES: None hazardous

ROUTES OF EXPOSURE

Target Organs: Liver, resp system, eyes, kidneys, skin
Health Hazards: Inhalation of vapor or dust is extremely irritating.
May cause burning of eyes and flow of tears.
May cause coughing, difficult breathing and nausea.
Brief exposure effects last only a few minutes.
Exposure in an enclosed area may be harmful.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation: irritation of upper respiratory tract; over-exposure may cause depression and injury to liver and kidney
Eye Contact: pain and mild irritation

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Effects should disappear after individual has been exposed to fresh air for approximately 10 minutes.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

DICHLORODIFLUOROMETHANE

CAS #:	75-71-8	ACGIH TLV:	1000 ppm
MOL. WT:	120.91	ACGIH STEL:	no data
CONC IDLH:	50000	OSHA PEL:	1000 ppm / 4950 mg/M3
NIOSH REL:	no data		

DESCRIPTION

Physical: Colorless gas with a characteristic ether-like odor
Odor: ether-like
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	-22 F	-30 C	Vapor Pressure:	5.7 atm
Melting Point:	0 F	-17.8 C	Ionization Potential:	11.97
Flash Point:	no data		Upper Explosion Limit:	no data
Solubility:	0.008%		Lower Explosion Limit:	no data

INCOMPATIBILITIES: Chemically active metals: sodium, potassium, calcium, powdered aluminum, zinc, magnesium

ROUTES OF EXPOSURE

Target Organs: eyes, CNS, cvs, pns
Health Hazards: Vapors may cause dizziness or suffocation
Contact with liquid may cause frostbite.
Fire may produce irritating or poisonous gases.

SYMPTOMS OF OVEREXPOSURE

Inhalation: Some narcosis when 10% in air is breathed.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen.

NFPA RATINGS

Health Hazard (Blue):	(0)no unusual health hazard
Flammability (Red):	(0)material does not readily burn
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

1,1-DICHLOROETHANE

CAS #:	75-34-3	ACGIH TLV:	100 ppm / 405 mg/M3
MOL. WT:	98.96	ACGIH STEL:	no data
CONC IDLH:	4000 ppm	OSHA PEL:	100 ppm / 400 mg/M3
NIOSH REL:	no data		

DESCRIPTION

Physical: Colorless liquid with a chloroform-like odor
Odor: chloroform
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	135 F	57.2 C	Vapor Pressure:	230 mm @ 25 C
Melting Point:	-142 F	-96.7 C	Ionization Potential:	no data
Flash Point:	21.6 F	-5.75 C	Upper Explosion Limit:	16%
Solubility:	<0.1%		Lower Explosion Limit:	6%

INCOMPATIBILITIES: Strong ox, strong caustics

ROUTES OF EXPOSURE

Target Organs: skin, liver, kidneys
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation: Irritation of respiratory tract. Salivation, sneezing, coughing, dizziness, nausea, and vomiting.
Eyes: Irritation, lacrimation and reddening of conjunctiva.
Skin: Irritation; prolonged or repeated skin contact can produce a slight burn.
Ingestion: Ingestion incidental to industrial handling is not considered to be a problem. Swallowing of substantial amounts could cause nausea, vomiting, faintness, drowsiness, cyanosis, and circulatory failure.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (3)extremely hazardous to health; full protection required. No skin surface should be exposed
Flammability (Red): (3)material can be ignited under almost all temperature conditions.
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

DICHLOROETHANE

CAS #:	1300-21-6	ACGIH TLV:	no data
MOL. WT:	no data	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: no data
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	no data
Melting Point:	no data	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	no data	Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

DICHLOROMETHANE

CAS #:	75-09-2	ACGIH TLV:	50 ppm
MOL. WT:	84.93	ACGIH STEL:	no data
CONC IDLH:	5000 ppm	OSHA PEL:	500 ppm
NIOSH REL:	pot. occupational carcinogen		

DESCRIPTION

Physical: Colorless liquid with a chloroform-like odor
Odor: sweetish, like chloroform or ether
Odor Threshold: 214 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	104 F	40 C	Vapor Pressure:	440 mm @ 25 C
Melting Point:	-142 F	-96.7 C	Ionization Potential:	11.35
Flash Point:	no data		Upper Explosion Limit:	19%
Solubility:	1.3%		Lower Explosion Limit:	12%

INCOMPATIBILITIES: Strong oxidizers, strong caustics, chemically active metals,
such as aluminum or magnesium powders; sodium, potassium. Reacts violently
with lithium, sodium potassium alloy, potassium-tert-butoxide

ROUTES OF EXPOSURE

Target Organs: Skin, cvs, eyes, CNS
Health Hazards: Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation: Anesthetic effects, nausea and drunkenness
Skin & Eyes: Skin irritation, irritation of eyes and nose

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Use first aid treatment according to the nature of the injury

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (1)material must be preheated before ignition can occur
Reactivity (Yellow): (0)stable even under fire conditions.
Special: no data

DIESEL FUEL

CAS #:	68512-90-3	ACGIH TLV:	no data
MOL. WT:	no data	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: Clear liquid
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	no data
Melting Point:	no data	Ionization Potential:	no data
Flash Point:	120.2 F 49 C	Upper Explosion Limit:	7.5%
Solubility:	negligible	Lower Explosion Limit:	0.5%

INCOMPATIBILITIES: Strong oxidizers

ROUTES OF EXPOSURE

Target Organs: eyes, skin
Health Hazards: May be poisonous if swallowed or absorbed through skin.
Vapors may cause dizziness or suffocation
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation of mist or high concentrations of vapor can produce dizziness, headache, nausea, and possibly irritation of the eyes, nose and throat.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (1)slightly hazardous to health; wear self-contained breathing apparatus as a precaution
Flammability (Red): (2)material must be moderately heated before ignition will occur
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

DIOCTYL PHTHALATE

CAS #: 117-84-0
MOL. WT: 390.62
CONC IDLH: no data
NIOSH REL: no data

ACGIH TLV: no data
ACGIH STEL: no data
OSHA PEL: no data

DESCRIPTION

Physical: no data
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point: 722.9 F 383.8 C
Melting Point: -58.3 F -50.2 C
Flash Point: 404.3 F 206.85 C
Solubility: no data

Vapor Pressure: no data
Ionization Potential: no data
Upper Explosion Limit: no data
Lower Explosion Limit: no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

DIOXANE

CAS #:	123-91-1	ACGIH TLV:	25 ppm / 90 mg/M3
MOL. WT:	88.12	ACGIH STEL:	no data
CONC IDLH:	2000 ppm	OSHA PEL:	100 ppm / 360 mg/M3
NIOSH REL:	1 ppm / 3.6 mg/M3		

DESCRIPTION

Physical: Colorless liquid with a mild ether-like odor; clear colorless liquid, sensitive to temperature

Odor: butyl alcohol; ethereal

Odor Threshold: 620 mg/M3

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	214 F	101.1 C	Vapor Pressure:	29 mm
Melting Point:	53 F	11.6 C	Ionization Potential:	9.13
Flash Point:	53.3 F	11.85 C	Upper Explosion Limit:	22%
Solubility:	soluble		Lower Explosion Limit:	2%

INCOMPATIBILITIES: Strong ox

ROUTES OF EXPOSURE

Target Organs: liver, kidneys, skin, eyes

Health Hazards: May be poisonous if swallowed or absorbed through skin.
Vapors may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

No significant irritation from brief exposure of skin; prolonged or repeated exposure may cause a rash or burn and absorption of toxic amounts leading to serious injury of liver and kidneys. Chemical has poor warning properties; illness may be delayed. Moderately irritating to eyes; overexposure may cause corneal injury.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus

Flammability (Red): (3)material can be ignited under almost all temperature conditions

Reactivity (Yellow): (1)normally stable, but may become unstable at elevated temperature and pressure

Special: no data

DI-SEC-OCTYL PHTHALATE

CAS #:	117-81-7	ACGIH TLV:	5 mg/M3
MOL. WT:	390.62	ACGIH STEL:	10 mg/M3
CONC IDLH:	no data	OSHA PEL:	5 mg/M3
NIOSH REL:	0.15 mg/M3		

DESCRIPTION

Physical: Clear, colorless, oily liquid with almost no odor
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	726.9 F	386.1 C	Vapor Pressure:	<0.01mm Hg @ 200 C
Melting Point:	-51 F	-46.2 C	Ionization Potential:	no data
Flash Point:	424.1 F	217.85 C	Upper Explosion Limit:	no data
Solubility:	0.005%		Lower Explosion Limit:	0.3 @ 474 F

INCOMPATIBILITIES: Nitrates, strong oxidizers, strong acids, strong alkalies

ROUTES OF EXPOSURE

Target Organs: git, skin, eyes
Health Hazards: Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Irrit eyes, muc membrane, nau, diarr; local irritation of skin, eyes, mucous membranes and bronchia; staggering, nausea and CNS depression

FIRST AID

In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (0)no unusual health hazard
Flammability (Red): (1)material must be preheated before ignition can occur
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

ENDRIN ALDEHYDE

CAS #:	7421-93-4	ACGIH TLV:	no data
MOL. WT:	no data	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: no data
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	no data
Melting Point:	no data	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	no data	Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

ETHENE, TRANS-1,2-DICHLORO-

CAS #:	156-60-5	ACGIH TLV:	no data
MOL. WT:	96.94	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: Colorless liquid,; ethereal, slightly acrid
Odor: pleasant
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	116.9 F 47.2 C	Vapor Pressure:	400 mm @ 40 C
Melting Point:	-57 F -49.4 C	Ionization Potential:	no data
Flash Point:	35.6 F 2 C	Upper Explosion Limit:	12.8%
Solubility:	nearly insoluble	Lower Explosion Limit:	9.7%

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: CNS, eyes, respiratory system
Health Hazards: May be poisonous if inhaled.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Nausea, vomiting, weakness, tremor and cramps, dermatitis; irritation of eyes, mucous membranes and upper respiratory tract; CNS depression and narcotic effect at high concentrations

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (3)material can be ignited under almost all temperature conditions
Reactivity (Yellow): (2)normally unstable and readily undergoes violent change, but does not detonate
Special: no data

ETHYL BENZENE

CAS #:	100-41-4	ACGIH TLV:	100 ppm / 435 mg/M3
MOL. WT:	106.18	ACGIH STEL:	125 ppm / 545 mg/M3
CONC IDLH:	2000 ppm	OSHA PEL:	100 ppm / 435 mg/M3
NIOSH REL:	no data		

DESCRIPTION

Physical: Colorless liquid with a sweet, gasoline-like odor
Odor: aromatic
Odor Threshold: 140 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	276.8 F	136 C	Vapor Pressure:	10 mm @ 25.9 C
Melting Point:	-139 F	-95 C	Ionization Potential:	8.76
Flash Point:	69.9 F	21.11 C	Upper Explosion Limit:	6.7%
Solubility:	0.015%		Lower Explosion Limit:	1.0%

INCOMPATIBILITIES: Strong oxidizers

ROUTES OF EXPOSURE

Target Organs: eyes, upper resp sys, skin, CNS
Health Hazards: May be poisonous if swallowed or absorbed through skin.
Vapors may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (3)material can be ignited under almost all temperature conditions
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

ETHYLENE DICHLORIDE

CAS #:	107-06-2	ACGIH TLV:	10 ppm / 40 mg/M3
MOL. WT:	98.96	ACGIH STEL:	15 ppm / 60 mg/M3
CONC IDLH:	1000 ppm	OSHA PEL:	50 ppm
NIOSH REL:	1 ppm / 4 mg/M3		

DESCRIPTION

Physical: Clear liquid with a sweet odor like chloroform
Odor: ether-like
Odor Threshold: 100 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	182.3 F	83.5 C	Vapor Pressure:	44 mm @ 10 C
Melting Point:	-31.8 F	-35.4 C	Ionization Potential:	10.5
Flash Point:	59.9 F	15.55 C	Upper Explosion Limit:	15.6%
Solubility:	0.8%		Lower Explosion Limit:	6.2%

INCOMPATIBILITIES: Strong oxidizers, strong caustics, chemically active metals, such as aluminum or magnesium powder, sodium, potassium

ROUTES OF EXPOSURE

Target Organs: kidneys, liver, eyes, skin, CNS
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation of vapors causes nausea, drunkenness, depression. Contact of liquid with eyes may produce corneal injury. Prolonged contact with skin may cause a burn.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (3)material can be ignited under almost all temperature conditions
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

ETHYLENE, TETRACHLORO-

CAS #:	127-18-4	ACGIH TLV:	50 ppm
MOL. WT:	165.82	ACGIH STEL:	200 ppm
CONC IDLH:	500 ppm	OSHA PEL:	100 ppm
NIOSH REL:	0.4 ppm		

DESCRIPTION

Physical:	Colorless liquid, chloroform-like odor
Odor:	mildly sweet
Odor Threshold:	5 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	249.8 F 121 C	Vapor Pressure:	15.8 mm @ 22 C
Melting Point:	-10.3 F -23.5 C	Ionization Potential:	9.32
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	0.015 g/ml @ 20 C / H ₂ O	Lower Explosion Limit:	no data

INCOMPATIBILITIES: Strong oxidizers, chemically active metals such as barium, lithium, beryllium, sodium

ROUTES OF EXPOSURE

Target Organs:	skin, mucous membrane, eyes, CNS, gi tract, liver, kidneys
Health Hazards:	Vapors may cause dizziness or suffocation. Exposure in an enclosed area may be very harmful. Contact may cause burns to skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Vapors can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Use first aid treatment according to the nature of the injury.

NFPA RATINGS

Health Hazard (Blue):	(2)hazardous to health; area may be entered with a self-contained breathing apparatus
Flammability (Red):	(0)material does not readily burn
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

FLUORENE

CAS #: 86-73-7
MOL. WT: no data
CONC IDLH: no data
NIOSH REL: no data

ACGIH TLV: no data
ACGIH STEL: no data
OSHA PEL: no data

DESCRIPTION

Physical: no data
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point: 568.4 F 298 C
Melting Point: 237.2 F 114 C
Flash Point: no data
Solubility: no data

Vapor Pressure: no data
Ionization Potential: no data
Upper Explosion Limit: no data
Lower Explosion Limit: no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

FUEL OIL

CAS #:	no data	ACGIH TLV:	no data
MOL. WT:	no data	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical:	no data
Odor:	no data
Odor Threshold:	no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	no data
Melting Point:	no data	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	no data	Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data

Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NEPA RATINGS

Health Hazard (Blue):	no data
Flammability (Red):	no data
Reactivity (Yellow):	no data
Special:	no data

GAS OIL

CAS #:	68476-30-2	ACGIH TLV:	no data
MOL. WT:	no data	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: no data
Odor: like kerosene; characteristic
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	no data
Melting Point:	no data	Ionization Potential:	no data
Flash Point:	149.7 F 65.41 C	Upper Explosion Limit:	no data
Solubility:	insoluble	Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: May be poisonous if swallowed or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation causes headache, slight giddiness. Ingestion causes nausea, vomiting, cramping, depression of central nervous system ranging from mild headache to anesthesia, coma, and death; Pulmonary irritation secondary to exhalation of solvent; signs of kidney and liver damage may be delayed. Aspiration causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (0)no unusual health hazard
Flammability (Red): (2)material must be moderately heated before ignition will occur
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

GASOLINE

CAS #:	8006-61-9	ACGIH TLV:	300 ppm / 900 mg/M3
MOL. WT:	no data	ACGIH STEL:	500 ppm / 1500 mg/M3
CONC IDLH:	no data	OSHA PEL:	200 ppm / 900 mg/M3
NIOSH REL:	pot. occupational carcinogen		

DESCRIPTION

Physical: liquid; gasoline with lead may contain colored dyes, usually red, blue, green or purple

Odor: no data

Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	no data
Melting Point:	no data	Ionization Potential:	6.19
Flash Point:	<-50.2 F <-45.65 C	Upper Explosion Limit:	7.4%
Solubility:	insoluable	Lower Explosion Limit:	1.4%

INCOMPATIBILITIES: Strong ox

ROUTES OF EXPOSURE

Target Organs: CNS, skin, eyes, liver

Health Hazards: May be poisonous if swallowed or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Ingestion causes inebriation, vomiting, vertigo, fever, drowsiness, confusion, cyanosis; aspiration causes bronchitis or pneumonia. Inhalation causes intense burning in throat and lungs; possibly bronchopneumonia.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue):	(1)slightly hazardous to health; wear self-contained breathing apparatus as a precaution
Flammability (Red):	(3)material can be ignited under almost all temperature conditions
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

HYDROGEN CYANIDE, ABSORBED

CAS #:	74-90-8	ACGIH TLV:	no data
MOL. WT:	no data	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	4.7 ppm / 5 mg/M3		

DESCRIPTION

Physical: Colorless liquid with an odor of bitter almonds
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	78.2 F 25.7 C	Vapor Pressure:	400 mm @ 9.8
Melting Point:	no data	Ionization Potential:	no data
Flash Point:	-459.7 F -273.15 C	Upper Explosion Limit:	40%
Solubility:	miscible	Lower Explosion Limit:	5.6%

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin.
Contact may cause burns to skin and eyes.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; watch victim.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

HYDROGEN CYANIDE, ANHYDROUS, STABILIZED

CAS #:	74-90-8	ACGIH TLV:	no data
MOL. WT:	27.03	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	4.7 ppm / 5 mg/M3		

DESCRIPTION

Physical: Colorless liquid with an odor of bitter almonds
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	78.2 F	25.7 C	Vapor Pressure:	400 mm @ 9.8
Melting Point:	8.2 F	-13.2 C	Ionization Potential:	no data
Flash Point:	-459.7 F	-273.15 C	Upper Explosion Limit:	40%
Solubility:	miscible		Lower Explosion Limit:	5.6%

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: Poison; extremely hazardous. May be fatal if inhaled or absorbed through skin.
Initial odor may be irritating, foul or absent and may deaden your sense of smell.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; watch victim.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

HYDROGEN SULFIDE

CAS #:	7783-06-4	ACGIH TLV:	10 ppm
MOL. WT:	34	ACGIH STEL:	15 ppm
CONC IDLH:	300 ppm	OSHA PEL:	20 ppm
NIOSH REL:	10 ppm / 15 mg/M3		

DESCRIPTION

Physical: Colorless liquified compressed gas with a rotten egg odor, but odorless at poisoness concentrations

Odor: <30 ppm: similar to rotten eggs
30 - 100 ppm: sickeningly sweet
>100 ppm: many people rapidly lose the ability to detect the smell

Odor Threshold: 0.02 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	-76 F -60 C	Vapor Pressure:	20 atm
Melting Point:	-117 F -82.8 C	Ionization Potential:	10.43
Flash Point:	no data	Upper Explosion Limit:	46%
Solubility:	2.9%	Lower Explosion Limit:	4.3%

INCOMPATIBILITIES: Strong oxidizers

ROUTES OF EXPOSURE

Target Organs: resp sys, lungs, eyes

Health Hazards: Poison; extremely hazardous. May be fatal if inhaled or absorbed through skin.
Initial odor may be irritating, foul or absent and may deaden your sense of smell.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Irritation of eyes, nose and throat. If high concentrations are inhaled, hyperpnea and respiratory paralysis may occur. Very high concentrations may produce pulmonary edema.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artifical respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Keep victim quiet and maintain normal body temperature. Effects may be delayed; watch victim.

NFPA RATINGS

Health Hazard (Blue):	(3)extremely hazardous to health; full protection required; no skin surface should be exposed
Flammability (Red):	(4)material forms readily ignitable mixtures in air
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

ISOPHORONE

CAS #:	78-59-1	ACGIH TLV:	5 ppm / 25 mg/M3
MOL. WT:	138.23	ACGIH STEL:	C
CONC IDLH:	800 ppm	OSHA PEL:	25 ppm / 140 mg/M3
NIOSH REL:	4 ppm / 23 mg/M3		

DESCRIPTION

Physical: Colorless or pale liquid with camphor-like odor
Odor: like camphor
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	419 F	215 C	Vapor Pressure:	0.2 mm @ 20 C
Melting Point:	17 F	-8.4 C	Ionization Potential:	7.68
Flash Point:	182.9 F	83.85 C	Upper Explosion Limit:	3.8%
Solubility:	1.2%		Lower Explosion Limit:	0.8%

INCOMPATIBILITIES: Strong oxidizers

ROUTES OF EXPOSURE

Target Organs: skin, eyes, kidneys
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation irritates eyes, nose and throat; causes central depression and has some anesthetic effect. Contact of liquid with eyes causes severe irritation and possible tissue damage. Skin is irritated by liquid and may crack on prolonged contact. Ingestion causes irritation of mouth and stomach.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue):	(2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red):	(2)material must be moderately heated before ignition will occur
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

KEROSENE

CAS #:	8008-20-6	ACGIH TLV:	no data
MOL. WT:	no data	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	100 mg/M3		

DESCRIPTION

Physical: Colorless watery liquid with a fuel oil odor; pale yellow or water white, mobile oily liquid

Odor: fuel oil odor

Odor Threshold: 1 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	347 F	175 C	Vapor Pressure:	2 mm Hg @ 21 C
Melting Point:	-50.1 F	-45.6 C	Ionization Potential:	6.79
Flash Point:	99.9 F	37.77 C	Upper Explosion Limit:	5.0%
Solubility:	insoluable		Lower Explosion Limit:	0.7%

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data

Health Hazards: May be poisonous if swallowed or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (0)no unusual health hazard

Flammability (Red): (2)material must be moderately heated before ignition will occur

Reactivity (Yellow): (0)stable even under fire conditions

Special: no data

LEAD

CAS #:	7439-92-1	ACGIH TLV:	0.15 mg/M3
MOL. WT:	207.19	ACGIH STEL:	no data
CONC IDLH:	700 mg/M3	OSHA PEL:	50 ug/M3
NIOSH REL:	< 0.1 mg/M3		

DESCRIPTION

Physical: Bluish-grey, soft metal; heavy ductile, soft, gray solid
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	3163.7 F 1739.8 C	Vapor Pressure:	1 mm @ 973 C
Melting Point:	621.4 F 327.4 C	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	insoluble	Lower Explosion Limit:	no data

INCOMPATIBILITIES: Strong ox, hydrogen peroxide, active metals, sodium, potassium, chlorine trifluoride, zirconium, disodium acetylide, oxidants

ROUTES OF EXPOSURE

Target Organs: GI, CNS, kidneys, blood, gingival tissue
Health Hazards: Poisonous if swallowed.
Inhalation of dust poisonous.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Abdominal pain, colic; hypotense, anemia, gingival lead line; trem, para wrist. Metallic taste, increased salivation, pyorrhea. Neuromuscular: numbness and tingling of extremities with sensory disturbance, extensor weakness of wrists and ankles, loss of muscle tone, tremor increased deep-tendon reflexes, muscular cramps and aching, muscular atrophy. CNS: visual disturbances, headache, nervousness of depression, insomnia, mental confusion, delirium.

FIRST AID

Move victim to fresh air and call emergency medical care. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

MERCURY

CAS #:	7439-97-6	ACGIH TLV:	0.1 mg/M3
MOL. WT:	200.59	ACGIH STEL:	skin
CONC IDLH:	28 mg/M3	OSHA PEL:	0.05 mg/M3
NIOSH REL:	0.05 mg/M3		

DESCRIPTION

Physical: Silvery, mobile, odorless liquid
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	673.9 F	356.6 C	Vapor Pressure:	0.0012 mm @ 20 C
Melting Point:	-38 F	-38.9 C	Ionization Potential:	112.9
Flash Point:	no data		Upper Explosion Limit:	no data
Solubility:	0.002%		Lower Explosion Limit:	no data

INCOMPATIBILITIES: Acetylenes, ammonia gas, baron metals, methyl azide, methylsilane, oxygen, oxidants, tetracarbonyl nickel

ROUTES OF EXPOSURE

Target Organs: Skin, resp. system, CNS, git, kidneys, eyes
Health Hazards: May be harmful if inhaled.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

No immediate symptoms. As poisoning becomes established, slight muscular tremor, loss of appetite, nausea and diarrhea are observed. Psychic, kidney and cardiovascular disturbances may occur.

FIRST AID

Move victim to fresh air and call emergency medical care. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

METHYL CHLOROFORM

CAS #:	71-55-6	ACGIH TLV:	350 ppm / 1900 mg/M3
MOL. WT:	133.40	ACGIH STEL:	450 ppm / 2450 mg/M3
CONC IDLH:	1000 ppm	OSHA PEL:	350 ppm / 1900 mg/M3
NIOSH REL:	350 ppm 1900 mg/M3		

DESCRIPTION

Physical: Colorless liquid with a mild, chloroform-like odor
Odor: chloroform-like; sweetish
Odor Threshold: 100 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	163.6 F	73.1 C	Vapor Pressure:	100 mm @ 20.0
Melting Point:	-35.4 F	-37.4 C	Ionization Potential:	no data
Flash Point:	no data		Upper Explosion Limit:	16%
Solubility:	0.07%		Lower Explosion Limit:	7%

INCOMPATIBILITIES: Strong caustics, strong oxidizers, chemically active metals such as aluminum, magnesium powders, sodium, potassium

ROUTES OF EXPOSURE

Target Organs: skin, eyes, CNS, cvs
Health Hazards: Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness
Ingestion: produces effects similar to inhalation and may cause some feeling of nausea
Eyes: slightly irritating and lachrymatory
Skin: defatting action may cause dermatitis

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Use first aid treatment according to the nature of the injury.

NFPA RATINGS

Health Hazard (Blue): (3)extremely hazardous to health; full protection required; no skin surface should be exposed
Flammability (Red): (1)material must be preheated before ignition can occur
Reactivity (Yellow): (1)normally stable, but may become unstable at elevated temperature or pressure
Special: no data

METHYL ISOBUTYL KETONE

CAS #:	108-10-1	ACGIH TLV:	50 ppm
MOL. WT:	100.18	ACGIH STEL:	75 ppm
CONC IDLH:	no data	OSHA PEL:	100 ppm / 410 mg/M3
NIOSH REL:	50 ppm 205 mg/M3		

DESCRIPTION

Physical: Colorless liquid
Odor: sharp; non-residual; ketonic
Odor Threshold: 0.47 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	244 F	117.7 C	Vapor Pressure:	15 mm
Melting Point:	-83.9 F	-119 C	Ionization Potential:	6.7
Flash Point:	71.3 F	21.85 C	Upper Explosion Limit:	7.5%
Solubility:	1.9%		Lower Explosion Limit:	1.4%

INCOMPATIBILITIES: Strong oxidizers

ROUTES OF EXPOSURE

Target Organs: resp sys, eyes, skin, CNS
Health Hazards: May be poisonous if swallowed or absorbed through skin.
Vapors may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Vapor causes irritation of eyes and nose; high concentrations cause anesthesia and depression. Liquid dries out skin and may cause dermatitis; irritates eyes but does not injure them.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (3)material can be ignited under almost all temperature conditions
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

NAPHTHALENE, 1-METHYL

CAS #:	90-12-0	ACGIH TLV:	no data
MOL. WT:	142.21	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: no data
Odor: no data
Odor Threshold: 0.023 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	464 F	240 C	Vapor Pressure:	no data
Melting Point:	-7.6 F	-22 C	Ionization Potential:	no data
Flash Point:	179.6F	82.01 C	Upper Explosion Limit:	no data
Solubility:	no data		Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Harmful if inhaled. Liquid causes irritation of the eyes and skin, and skin photosensitization. Harmful if swallowed. Chronic exposure may cause liver or kidney damage.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. If material has been ingested and victim is conscious, have victim drink large amounts of warm water and induce vomiting. If victim is unconscious or having convulsions, do nothing but keep victim warm.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

METHYL CHLORIDE

CAS #:	74-87-3	ACGIH TLV:	50 ppm
MOL. WT:	50.49	ACGIH STEL:	100 mg/M3
CONC IDLH:	10000 ppm	OSHA PEL:	100 ppm
NIOSH REL:	pot. occupational carcinogen		

DESCRIPTION

Physical: Colorless gas with a faint, sweet odor which is not noticed at dangerous concentrations

Odor: ether-like

Odor Threshold: 100 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	-12 F -24.5 C	Vapor Pressure:	4.8 atm
Melting Point:	-144 F -97.8 C	Ionization Potential:	11.26
Flash Point:	no data	Upper Explosion Limit:	19%
Solubility:	insoluble	Lower Explosion Limit:	7.6%

INCOMPATIBILITIES: chemically active metals; potassium, powdered aluminum, zinc, magnesium

ROUTES OF EXPOSURE

Target Organs: CNS, liver, kidneys, skin

Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin.

Contact causes burns to skin and eyes.

Contact with liquid may cause frostbite.

Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation causes nausea, vomiting, weakness, headache, emotional disturbances; high concentrations cause mental confusion, eye disturbances, muscular tremors, cyanosis, convulsions. Contact of liquid with skin may cause frostbite.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; watch victim.

NFPA RATINGS

Health Hazard (Blue):	(2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red):	(4)material forms readily ignitable mixtures in air
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

NAPHTHALENE

CAS #:	91-20-3	ACGIH TLV:	10 ppm / 50 mg/M3
MOL. WT:	128.18	ACGIH STEL:	15 ppm / 75 mg/M3
CONC IDLH:	500 ppm	OSHA PEL:	10 ppm / 50 mg/M3
NIOSH REL:	no data		

DESCRIPTION

Physical: Colorless to brown solid or molten solid with an odor of mothballs;
white crystalline volatile flakes

Odor: mothball-like

Odor Threshold: 0.03 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	424.1 F	217.8 C	Vapor Pressure:	1 mm @ 52.6 C
Melting Point:	176 F	80 C	Ionization Potential:	8.14
Flash Point:	173.9 F	78.85 C	Upper Explosion Limit:	5.9%
Solubility:	0.003%		Lower Explosion Limit:	0.9%

INCOMPATIBILITIES: Strong oxidizers; incompatible with dinitrogen pentoxide;
reacts violently with chlorine trioxide

ROUTES OF EXPOSURE

Target Organs: eyes, blood, liver, kidneys, skin, rbc, CNS

Health Hazards: Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Vapors or fumes are irritating to eyes, nose, and throat and may cause headaches, dizziness, nausea, etc. Solid may be irritating to skin.

FIRST AID

Move victim to fresh air and call emergency medical care. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus

Flammability (Red): (2)material must be moderately heated before ignition will occur

Reactivity (Yellow): (0)stable even under fire conditions

Special: no data

NICKEL

CAS #:	7440-02-0	ACGIH TLV:	1 mg/M3
MOL. WT:	58.71	ACGIH STEL:	as NICKEL
CONC IDLH:	no data	OSHA PEL:	1 mg/M3
NIOSH REL:	0.015 mg/M3		

DESCRIPTION

Physical: no data
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	5138.3 F 2836.8 C	Vapor Pressure:	no data
Melting Point:	2830.7 F 1554.8 C	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	insoluble	Lower Explosion Limit:	no data

INCOMPATIBILITIES: Strong acids, sulfur, $\text{Ni}(\text{NO}_3)_2$, wood, other combustibles

ROUTES OF EXPOSURE

Target Organs: nasal cavities, lungs, skin
Health Hazards: Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Cancer lungs, nasal cavities; pneumonitis; allergic asthma sens derm. gingivitis, stomatitis (inflammation of the mouth), metallic taste, metal fume fever, nickel dermatitis, eczema (swelling) by sensitization, anosmia, sinus and pulmonary carcinogenesis by long period exposure.

FIRST AID

Move victim to fresh air and call emergency medical care. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

POLYCHLORINATED BIPHENYLS

CAS #:	1336-36-3	ACGIH TLV:	no data
MOL. WT:	no data	ACGIH STEL:	2 ppm
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: light yellow oily liquid or white solid powder with a weak odor
Odor: practically odorless
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	no data
Melting Point:	no data	Ionization Potential:	no data
Flash Point:	-459.7 F -273.15 C	Upper Explosion Limit:	no data
Solubility:	no data	Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: skin, liver
Health Hazards: Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Acne from skin contact.

FIRST AID

In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue):	no data
Flammability (Red):	no data
Reactivity (Yellow):	no data
Special:	no data

PETROLEUM SPIRITS

CAS #:	8030-30-6	ACGIH TLV:	no data
MOL. WT:	no data	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	100 ppm / 400 mg/M3
NIOSH REL:	no data		

DESCRIPTION

Physical: no data
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	no data	Vapor Pressure:	no data
Melting Point:	no data	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	no data	Lower Explosion Limit:	no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: May be poisonous if swallowed or absorbed through skin.
Vapors may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

PHENANTHRENE

CAS #: 85-01-8
MOL. WT: no data
CONC IDLH: no data
NIOSH REL: no data

ACGIH TLV: no data
ACGIH STEL: no data
OSHA PEL: 0.2 mg/M3

DESCRIPTION

Physical: no data
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point: 644 F 340 C
Melting Point: 210.2 F 99 C
Flash Point: no data
Solubility: no data

Vapor Pressure: no data
Ionization Potential: no data
Upper Explosion Limit: no data
Lower Explosion Limit: no data

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: no data
Health Hazards: Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

no data

FIRST AID

In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

PHENOL

CAS #:	108-95-2	ACGIH TLV:	5 ppm / 19 mg/M3
MOL. WT:	94.12	ACGIH STEL:	no data
CONC IDLH:	250 ppm	OSHA PEL:	5 ppm / 19 mg/M3
NIOSH REL:	5 ppm / 19 mg/M3		

DESCRIPTION

Physical: Colorless or white crystalline solid that may redden on exposure to light and heat; also sold as a liquid solution

Odor: somewhat sickening sweet and acid

Odor Threshold: 0.05 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	359 F	181.6 C	Vapor Pressure:	0.35 mm @ 25 C
Melting Point:	106 F	41.1 C	Ionization Potential:	13.6
Flash Point:	173.9 F	78.85 C	Upper Explosion Limit:	8.6%
Solubility:	9.3% @ 25 C		Lower Explosion Limit:	1.7%

INCOMPATIBILITIES: Strong oxidizers, calcium hypochlorite

ROUTES OF EXPOSURE

Target Organs: pancreas, spleen, lungs, liver, kidneys, skin, eyes

Health Hazards: Poisonous; may be fatal if inhaled, swallowed or absorbed through skin.

Contact may cause burns to skin and eyes.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Will burn eyes and skin. The analgesic action may cause loss of pain sensation. Readily absorbed through skin, causing increase in heart rate, convulsions, and death.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; watch victim.

NFPA RATINGS

Health Hazard (Blue): (3)extremely hazardous to health; full protection required; no skin surface should be exposed

Flammability (Red): (2)material must be moderately heated before ignition will occur

Reactivity (Yellow): (0)stable even under fire conditions

Special: no data

PYRIDINE

CAS #:	110-86-1	ACGIH TLV:	5 ppm / 15 mg/M3
MOL. WT:	79.11	ACGIH STEL:	no data
CONC IDLH:	3600 ppm	OSHA PEL:	5 ppm / 15 mg/M3
NIOSH REL:	no data		

DESCRIPTION

Physical: Colorless or yellow liquid with a penetrating, sickening odor
Odor: disagreeable; strong unpleasant; characteristic unpleasant; sharp, penetrating unpleasant
Odor Threshold: 0.021

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	239 F	115 C	Vapor Pressure:	10 mm @ 13.2 C
Melting Point:	-43.6 F	-42 C	Ionization Potential:	9.27
Flash Point:	67.7 F	19.85 C	Upper Explosion Limit:	12.4%
Solubility:	miscible		Lower Explosion Limit:	1.8%

INCOMPATIBILITIES: Strong oxidizers, strong acids

ROUTES OF EXPOSURE

Target Organs: skin, eye irritant; CNS, liver, kidney, gi system
Health Hazards: May be poisonous if swallowed or absorbed through skin.
Vapors may cause dizziness or suffocation.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Vapor irritates eyes and nose. Liquid irritates skin and is absorbed through the skin.
Overexposure causes nausea, headache, nervous symptoms, increased urinary frequency.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (3)material can be ignited under almost all temperature conditions
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

TOLUENE

CAS #:	108-88-3	ACGIH TLV:	50 ppm / 188 mg/M3
MOL. WT:	92	ACGIH STEL:	no data
CONC IDLH:	2000 ppm	OSHA PEL:	200 ppm
NIOSH REL:	100 ppm / 375 mg/M3		

DESCRIPTION

Physical: Colorless watery liquid with a pleasant odor
Odor: strong, pleasant
Odor Threshold: 40 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	230.8 F	110.4 C	Vapor Pressure:	36.7 mm @ 30 C
Melting Point:	-139.3 F	-95.2 C	Ionization Potential:	8.82
Flash Point:	40 F	4.45 C	Upper Explosion Limit:	7.1%
Solubility:	0.05%		Lower Explosion Limit:	1.3%

INCOMPATIBILITIES: Strong ox

ROUTES OF EXPOSURE

Target Organs: CNS, liver, kidneys, skin, eyes
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue):	(2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red):	(3)material can be ignited under almost all temperature conditions
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

TRICHLOROETHYLENE

CAS #:	79-01-6	ACGIH TLV:	50 ppm
MOL. WT:	131	ACGIH STEL:	200 ppm
CONC IDLH:	1000 ppm	OSHA PEL:	50 ppm / 270 mg/M3
NIOSH REL:	25 ppm		

DESCRIPTION

Physical: Colorless watery liquid with a sweet odor
Odor: chloroform-like; ethereal
Odor Threshold: 50 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	188 F	86.6 C	Vapor Pressure:	58 mm
Melting Point:	-123 F	-86.2 C	Ionization Potential:	9.47
Flash Point:	no data		Upper Explosion Limit:	41%
Solubility:	0.1%		Lower Explosion Limit:	11%

INCOMPATIBILITIES: Strong caustics; when acidic reacts with aluminum; chemically active metals; barium, lithium, sodium, magnesium, titanium

ROUTES OF EXPOSURE

Target Organs: Eyes, skin, nose, throat, resp. system, heart, liver, kidneys,
CNS Health Hazards: Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation: Symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and finally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury.
Ingestion: Symptoms similar to inhalation
Skin: Defatting action can cause dermatitis.
Eyes: Slightly irritating sensation and lachrymation.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Use first aid treatment according to the nature of the injury.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (1)material must be preheated before ignition can occur
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

VINYL CHLORIDE

CAS #:	75-01-4	ACGIH TLV:	5 ppm
MOL. WT:	62.50	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	1 ppm
NIOSH REL:	pot. occupational carcinogen		

DESCRIPTION

Physical: Colorless liquified compressed sag with a sweet odor
Odor: pleasant, sweet
Odor Threshold: 260 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	7.2 F -13.8 C	Vapor Pressure:	2600 mm @ 25
Melting Point:	-244.8 F -153.8 C	Ionization Potential:	7.57
Flash Point:	-110.5 F -79.15 C	Upper Explosion Limit:	33%
Solubility:	insoluable	Lower Explosion Limit:	3.6%

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: skin, eyes, mucous membranes, nervous system, liver, kidneys
Health Hazards: May be poisonous if inhaled.
Contact may cause burns to skin and eyes.
Vapors may cause dizziness or suffocation.
Contact with liquid may cause frostbite.
Fire may produce irritating or poisonous gases.

SYMPTOMS OF OVEREXPOSURE

Inhalation: high concentrations cause dizziness, anesthesia, lung irritation
Skin: may cause frostbite; phenol inhibitor may be absorbed through skin if large amounts of liquid evaporate

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of frostbite, thaw frosted parts with water. Keep victim quiet and maintain normal body temperature.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (4)material forms readily ignitable mixtures in air
Reactivity (Yellow): (1)normally stable, but may become unstable at elevated temperatures and pressures
Special: no data

XYLENE

CAS #:	1330-20-7	ACGIH TLV:	100 ppm / 435 mg/M3
MOL. WT:	106.18	ACGIH STEL:	150 ppm / 655 mg/M3
CONC IDLH:	1000 ppm	OSHA PEL:	100 ppm / 435 mg/M3
NIOSH REL:	100 ppm / 434 mg/M3		

DESCRIPTION

Physical: Colorless liquid with aromatic odor
Odor: like benzene; characteristic aromatic
Odor Threshold: 0.05

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	281.9 F	138.8 C	Vapor Pressure:	6.7 mm @21 C
Melting Point:	-15.1 F	-26.2 C	Ionization Potential:	8.56
Flash Point:	80.9 F	27.2 C	Upper Explosion Limit:	7%
Solubility:	very sl sol		Lower Explosion Limit:	1%

INCOMPATIBILITIES: Strong oxidizers

ROUTES OF EXPOSURE

Target Organs: CNS, eyes, gi tract, blood, liver, kidneys, skin
Health Hazards: May be poisonous if swallowed or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Dizziness, excitement, drowsiness, incoherence, staggering gait, irritated eyes, nose, throat, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermal irritation.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (3)material can be ignited under almost all temperature conditions
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

m-XYLENE

CAS #:	108-38-3	ACGIH TLV:	100 ppm / 435 mg/M3
MOL. WT:	106.18	ACGIH STEL:	150 ppm / 655 mg/M3
CONC IDLH:	1000 ppm	OSHA PEL:	100 ppm / 435 mg/M3
NIOSH REL:	100 ppm / 434 mg/M3		

DESCRIPTION

Physical: colorless liquid
Odor: aromatic
Odor Threshold: 0.05 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	280.4 F 138 C	Vapor Pressure:	10 mm @ 28.3 C
Melting Point:	117.3 F 47.4 C	Ionization Potential:	no data
Flash Point:	80.3 F 26.85 C	Upper Explosion Limit:	7.0%
Solubility:	insoluble	Lower Explosion Limit:	1.1%

INCOMPATIBILITIES: no data

ROUTES OF EXPOSURE

Target Organs: eyes, nervous system, liver, kidneys
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache and coma; can be fatal. Kidney and liver damage can occur.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (3)material can be ignited under almost all temperature conditions
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

o-XYLENE

CAS #:	95-47-6	ACGIH TLV:	100 ppm / 435 mg/M3
MOL. WT:	106.18	ACGIH STEL:	150 ppm / 655 mg/M3
CONC IDLH:	1000 ppm	OSHA PEL:	100 ppm / 435 mg/M3
NIOSH REL:	100 ppm / 434 mg/M3		

DESCRIPTION

Physical: colorless watery liquid with a sweet odor
Odor: aromatic
Odor Threshold: 0.05 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	291.6 F	144.2 C	Vapor Pressure:	10 mm @ 32.1 C
Melting Point:	-13.7 F	-25.4 C	Ionization Potential:	7.5
Flash Point:	89.3 F	31.85 C	Upper Explosion Limit:	6%
Solubility:	very sl sol		Lower Explosion Limit:	1%

INCOMPATIBILITIES: Strong ox

ROUTES OF EXPOSURE

Target Organs: CNS, eyes, gi tract, blood, liver, kidneys, skin
Health Hazards: May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red): (3)material can be ignited under almost all temperature conditions
Reactivity (Yellow): (0)stable even under fire conditions
Special: no data

p-XYLENE

CAS #:	106-42-3	ACGIH TLV:	100 ppm / 434 mg/M3
MOL. WT:	106.18	ACGIH STEL:	150 ppm / 655 mg/M3
CONC IDLH:	1000 ppm	OSHA PEL:	100 ppm / 435 mg/M3
NIOSH REL:	100 ppm / 434 mg/M3		

DESCRIPTION

Physical:	colorless liquid; mobile flammable liquid; clear plates or prisms
Odor:	aromatic
Odor Threshold:	0.05 ppm

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	280.9 F 138.3 C	Vapor Pressure:	10 mm @ 27.3 C
Melting Point:	55.9 F 13.3 C	Ionization Potential:	no data
Flash Point:	80.3 F 26.85 C	Upper Explosion Limit:	7.0%
Solubility:	insoluble	Lower Explosion Limit:	1.0%

INCOMPATIBILITIES: May react with oxidizing materials; acetic acid and air; nitric acid 1,3-dichloro-5, 5-dimethyl-2, 4-imid-azolidindione

ROUTES OF EXPOSURE

Target Organs:	CNS, gi tract, eyes, blood, liver, kidneys, skin
Health Hazards:	May be poisonous if swallowed or absorbed through skin. Vapors may cause dizziness or suffocation. Contact may irritate or burn skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache and coma. Can be fatal. Kidney and liver damage can occur.

FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NFPA RATINGS

Health Hazard (Blue):	(2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red):	(3)material can be ignited under almost all temperature conditions
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

ZINC

CAS #:	7440-66-6	ACGIH TLV:	no data
MOL. WT:	no data	ACGIH STEL:	no data
CONC IDLH:	no data	OSHA PEL:	no data
NIOSH REL:	no data		

DESCRIPTION

Physical: bluish-white, lustrous, metallic element
Odor: no data
Odor Threshold: no data

CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	1666.4 F 908 C	Vapor Pressure:	1 mm @ 487
Melting Point:	787.6 F 419.8 C	Ionization Potential:	no data
Flash Point:	no data	Upper Explosion Limit:	no data
Solubility:	no data	Lower Explosion Limit:	no data

INCOMPATIBILITIES: Acids, strong bases, chlorine, bromine

ROUTES OF EXPOSURE

Target Organs: skin
Health Hazards: Contact may cause burns to skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

SYMPTOMS OF OVEREXPOSURE

Inhalation of fumes may result in sweet taste, throat dryness, cough, weakness, generalized aching, chills, fever, nausea, vomiting; a human skin irritant; and pul-pure zinc powder, dust, fume is relatively non-toxic to humans via irritation or inhalation. Difficulty arises from oxidation of zinc fumes prior to inhalation or presence of impurities such as lead, arsenic, cadmium, antimony.

FIRST AID

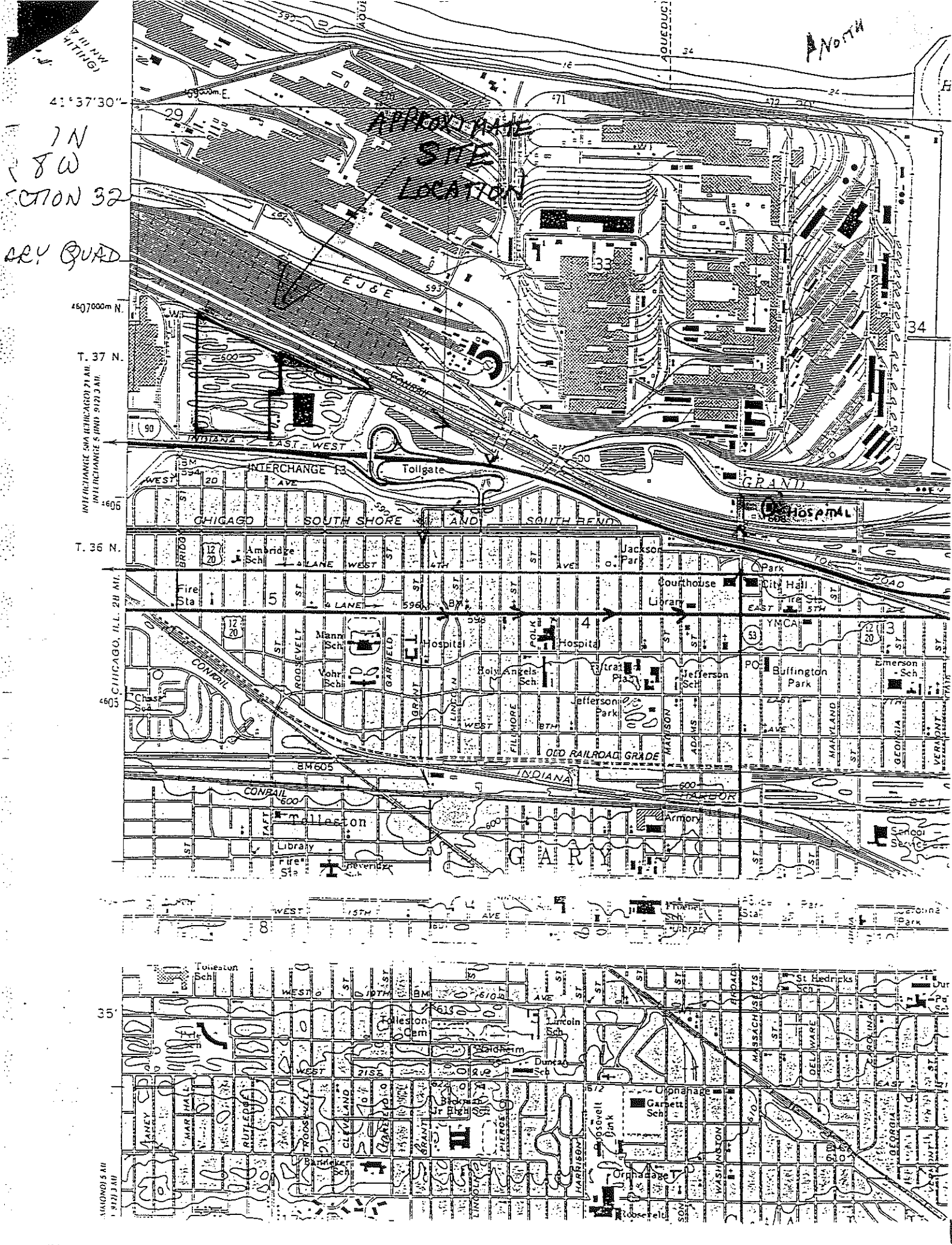
In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

NEPA RATINGS

Health Hazard (Blue): no data
Flammability (Red): no data
Reactivity (Yellow): no data
Special: no data

C

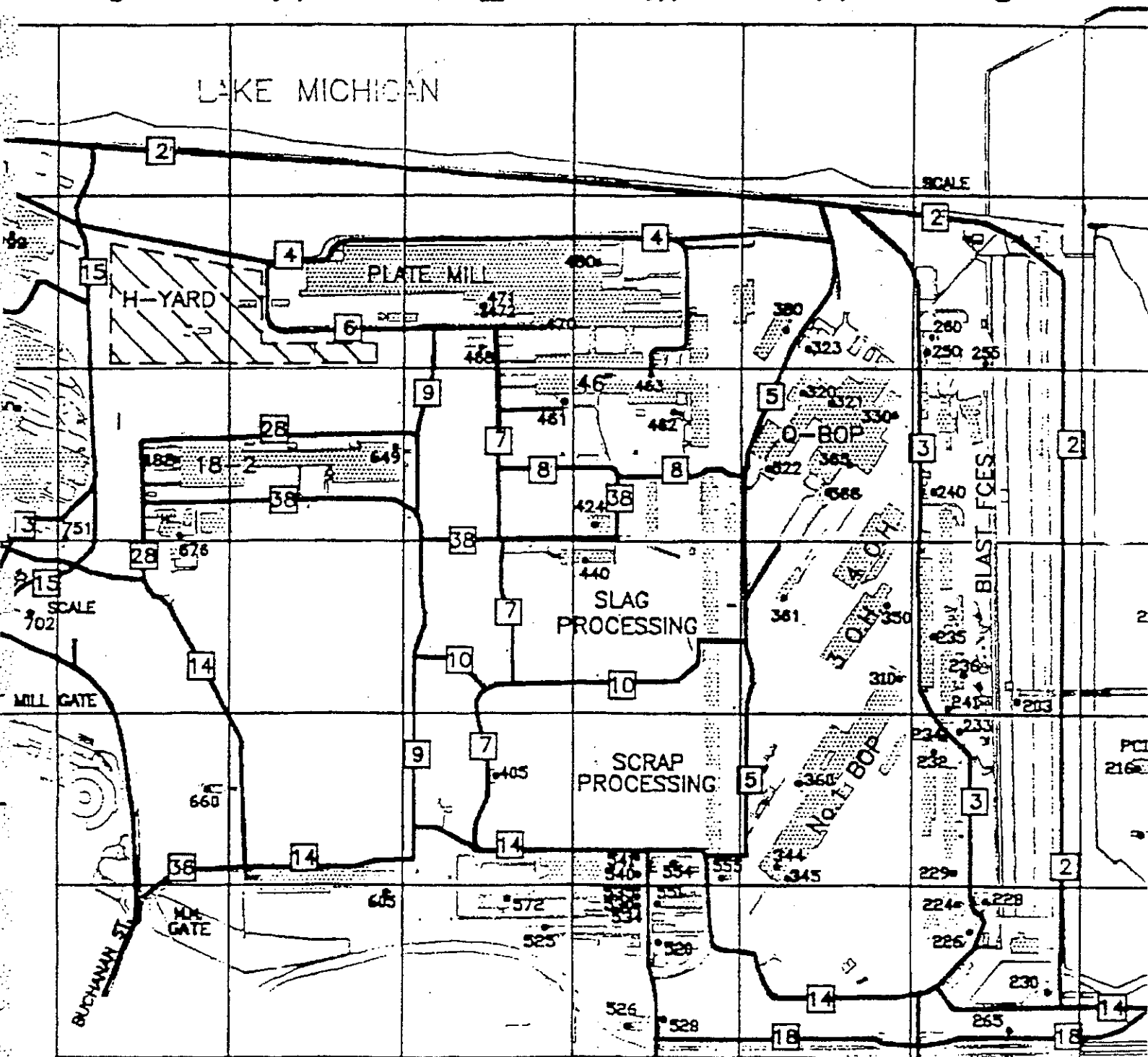
SITE MAPS



AL RECEIVING TRUCK

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SEVERE WEATHER

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SEVERE WEATHER

When projects are conducted outside, the potential for severe weather must be considered. Thunderstorms, tornadoes, and winter storms can develop quickly, jeopardizing your safety. The following emergency procedures are to be followed in the event of severe weather.

THUNDERSTORMS AND LIGHTNING

Monitor weather conditions at all times while working. At a sign of an impending storm - increased cloudiness, darkened skies, increased wind - listen to a radio for the latest weather information.

When a thunderstorm accompanied by lightning is in the project area, cease work immediately. All powered equipment, such as drill rigs, are to be shut down.

Seek shelter inside nearby buildings or trailers. If there are no buildings nearby, seek shelter inside your vehicle.

If you are caught outside, do not stand beneath tall, isolated trees or telephone poles. Avoid areas projecting above the landscape such as hill tops. In open areas, go to a low place such as a ravine or valley. Stay away from open water, metal equipment, wire fences and metal pipes. If you are in a group of people in the open, spread out, staying several yards apart.

If you are caught in a level field or open area far from shelter and you feel your hair stand on end, lightning may be about to strike you. Drop to your knees and bend forward, putting your hands on your knees. You should minimize the body area in direct contact with the ground. Do not lie flat on the ground.

If someone has been struck by lightning, monitor life signs and begin administering mouth-to-mouth resuscitation or cardiopulmonary resuscitation as needed. Send for help.

Check conscious victims for burns, especially at the fingers and toes and next to buckles and jewelry. Administer first aid for shock. Do not let the victim walk around.

TORNADOES

Tornadoes usually develop from thunderstorms and normally occur at the trailing edge of the storm. Most tornadoes occur in the months of April, May, June, and July in the late afternoon and early evening hours.

When storms are predicted for the project area, monitor weather conditions on a radio. A tornado watch is issued when favorable conditions exist for the development of a tornado. A tornado warning is issued by the local weather service office whenever a tornado has actually been sighted or is strongly indicated by radar.

If a tornado warning is issued, seek shelter immediately. If there are permanent buildings located on site, go there immediately, moving toward interior hallways or small rooms on the lowest floor.

If a tornado warning is issued and you are in a vehicle or a site trailer, leave and go to the nearest building. If there are no buildings nearby, go in the nearest ditch, ravine or culvert, with your hands shielding your head.

If a tornado is sighted or a warning issued while you are in open country, lie flat in a ditch or depression. Hold onto something on the ground, such as a bush or wooden fence post, if possible.

Once a tornado has passed the site, site personnel are to assemble at the designated assembly area to determine if anyone is missing. Administer first aid and seek medical attention as needed.

WINTER STORMS

When snow or ice storms are predicted for the project area, site personnel should monitor weather conditions on a radio. A winter storm watch is issued when a storm has formed and is approaching the area. A winter storm warning is issued when a storm is imminent and immediate action is to be taken.

When a storm watch is issued, monitor weather conditions and prepare to halt site activities. Notify the project manager of the situation. Seek shelter at site buildings or leave the site and seek warm shelter.

If you are caught in a severe winter storm while traveling, seek warm shelter if road conditions prevent safe travel.

If you are stranded in a vehicle during a winter storm:

- Stay in the vehicle. Disorientation comes quickly in blowing and drifting snow.
- Wait for help.
- Keep a window open an inch or so to avoid carbon monoxide poisoning.
- Run the engine and heater sparingly.
- Keep watch - do not let everyone sleep at the same time.
- Exercise occasionally.

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TEMPERATURE STRESS

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TEMPERATURE STRESS

This section outlines the signs and symptoms of temperature stress in addition to the engineering controls, work practice controls and other management techniques that should be used to reduce temperature stress. Individual susceptibilities to temperature stress need to be considered and used to pace the work being performed with the most susceptible person controlling the work/rest schedule. Monitoring for heat stress is to be performed as detailed in this section.

COLD STRESS

Reduction

The following engineering controls are recommended for reduction of cold stress:

- Use general or spot heating to increase temperature at work site if this does not create a hazardous situation.
- Shield work area from wind.
- Cover metal handles of tools and equipment with thermal insulating materials.
- Do not sit on unprotected metal chair seats.
- Use heated rest areas if work is to be performed in an equivalent chill temperature of 20° F or below.

The following work practice controls are recommended to reduce cold stress:

- Drink warm, caffeine-free, sweet, non-alcoholic drinks or soup frequently.
- Schedule work for warmest part of the day.
- Use heated rest areas regularly.
- Use the buddy system. Do not work alone. Observe your co-workers for signs and symptoms of cold stress.
- Allow and encourage workers to pace themselves and take extra breaks when needed. The work schedule should be set by the person most susceptible to cold stress. Do not pressure someone to work beyond their capabilities.

- Whenever possible, allow new workers time to adjust to working in a cold environment before working full time. Ideally, acclimation should occur over five days: 20% Day 1 with a 20% increase on each successive day.
- When possible, arrange the work to minimize standing or sitting still for long periods of time.
- Reorganize work procedures so as much of a job as possible can be done in a warm environment.
- Avoid overtime.
- Remove outer layer of clothing when entering warm shelter.
- If clothes are wet, change to dry work clothes before returning to work in cold. If not possible, loosen clothing to facilitate evaporation of sweat.
- Develop and adhere to a work-rest schedule, using the guidelines which follow.

Air Temperature with Sunny Sky (degrees F)	Work/Break Schedule (minutes)				
	no wind	5 mph wind	10 mph wind	15 mph wind	20 mph wind
-15 to -19	110/10	110/10	75/10	55/10	40/10
-20 to -24	110/10	75/10	55/10	40/10	30/10
-25 to -29	75/10	55/10	40/10	30/10	cease
-30 to -34	55/10	40/10	30/10	cease	cease
-35 to -39	40/10	30/10	cease	cease	cease
-40 to -44	30/10	cease	cease	cease	cease
-45 & below	cease	cease	cease	cease	cease

Notes

1. These recommendations and guidelines are adapted from Threshold Limit Values and Biological Exposure Indices for 1993-1994, published by the American Conference of Governmental Industrial Hygienists, Cincinnati, OH.
2. 05 mph wind - light flag moves, 10 mph wind - light flag fully extended, 15 mph wind - raises newspaper sheet, 20 mph wind - blowing and drifting snow

The practicality of working under a work-rest schedule, together with the ability of the necessary equipment to function properly in cold weather, may be more restrictive than the health hazards and also need to be considered. The cold stress schedules noted above apply to moderate to heavy work activities. Light to moderate work activities can be moved down one level.

Signs and Symptoms

Send a worker to warm shelter immediately if any of the following symptoms are noted:

- Heavy shivering
- Frostnip (skin turns white)
- Feeling of excessive fatigue
- Drowsiness
- Euphoria

First Aid

Take victim to a warm area. Remove the outer layers of clothing. Gently warm the affected area, submerge it in tepid water if possible but do not rub. If there is evidence of frostbite, obtain medical attention immediately.

HEAT STRESS

Reduction

While site specific conditions need to be considered, the following guidelines are recommended to prevent or reduce the effects of heat stress.

- Develop and adhere to a work-rest schedule using the guidelines at the end of this section.
- Take breaks in cool areas.
- Drink fluids hourly. The fluids should be caffeine-free and non-alcoholic. Water or electrolyte-replacement drinks, such as Gatorade™, are good choices. Do not wait until you are thirsty. Your normal thirst mechanism is not sufficient to overcome the effects of dehydration. If you feel thirsty, you are already becoming dehydrated.
- Schedule work for the cooler part of the day -- early morning and/or early evening.
- Allow and encourage workers to pace themselves and take extra breaks when needed. The work schedule should be set by the person most susceptible to heat stress. Do not pressure someone to work beyond their capabilities.
- Whenever possible, allow new workers time to adjust to working in a hot environment before working full time. Ideally, acclimation should occur over five days: 20% Day 1 with a 20% increase on each successive day.
- Avoid overtime.

- Use the buddy system. Never work alone and watch your co-workers for signs of heat stress.

Personal Monitoring

At each work break, count your pulse during a 30 second period as early as possible in the rest period.

- If your heart rates exceeds 110 beats per minute (BPM) at beginning of rest period, shorten your next work cycle by 1/3 and keep the rest period the same.
- If your heart rate still exceeds 110 BPM at that next rest period, shorten the following work cycle by 1/3.

At the beginning and end of each work shift, measure your weight, ± 0.25 LB, wearing similar clothes. You should not lose more than 1.5 % of your total body weight in a work day. If you do, drink fluids to compensate and to prevent dehydration.

A summary of recommended work breaks and personal monitoring schedule follows. These values apply to moderate work levels. For heavy work levels, apply monitoring schedule one level up. Light to sedentary work activities can be moved down one level if workers are acclimated and show no signs of heat stress.

Adjusted Temperature* (°)	Heat Stress Monitoring (min)	
	Normal Work Clothes	Impermeable Work Clothes
above 90	45	15
88 to 90	60	30
83 to 87	90	60
77 to 82	120	90
72 to 78	150	120

* Adjusted temperature = measured temperature + (13 x % sunshine)

Note

1. These recommendations and guidelines are adapted from Threshold Limit Values and Biological Exposure Indices for 1990-1991, published by the American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

Signs and Symptoms

- Heat rash
- Heat cramps: Muscle spasms; pain in hands, feet or abdomen

- Heat exhaustion: Pale, cool, moist skin; heavy sweating; dizziness; nausea; fainting
- Heat stroke: Red, hot, usually dry skin; lack of, or reduced, perspiration; nausea; dizziness; confusion; strong, rapid pulse; coma

First Aid

Remove the affected individual's protective clothing and equipment. Wrap the victim in wet towels or clothing. If there are signs or symptoms of heat exhaustion or heat stroke, get medical attention immediately.

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GENERAL HEALTH AND SAFETY RULES

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GENERAL HEALTH AND SAFETY RULES

Personnel will follow these procedures when performing the specified tasks or work in the designated area.

SAFETY RULES WHEN WORKING NEAR HIGHWAYS OR CONSTRUCTION SITE TRAFFIC

Set out traffic cones, warning signs, and flashers when performing field work in traffic areas. In traffic areas and on construction sites where heavy equipment is operating, wear luminous traffic vests.

Wear safety vests when working closer than 10 ft from a roadway.

Use safety signs when performing bridge and highway surveys and use warning lights on vehicles, as appropriate.

Let the construction equipment operators know you are around. Have "eye to eye" contact prior to setting up for a test.

Check the traffic pattern on construction projects before entering with a vehicle.

Stay away from the swing of the back-hoe bucket.

If practical, use your vehicle on a large site to divert construction traffic around the test area.

Park the testing vehicle between your work area and the operating equipment. Always work a significant distance behind your vehicle to allow for it being struck.

SAFETY RULES FOR HAZARDOUS WASTE SITES

Smoking is not permitted at the site or in the site trailer.

Eating and drinking are only permitted in the support or clean zone.

Secure all loose equipment in the test vehicle which might "fly" when making sudden stops.

No open fires are allowed.

All employees handling hazardous waste samples or who may be exposed to hazardous or solid waste must be active participants in the medical surveillance program.

A respirator can not be worn when beards or any other facial hair interferes with the face-to-respirator seal. Individuals with such facial hair are not to be allowed to work in Level of Protection C or B.

Working alone on field sites is generally prohibited. The "buddy system" is to be enforced at all times unless the Health and Safety Coordinator (HSC) specifically exempts the work from his requirement, based on the HSC's review of site conditions and hazards. When working under the "buddy system", personnel are to:

- Never work alone
- Provide partner with assistance
- Observe partner for signs for overexposure/temperature stress
- Check integrity of partner's protection clothing
- Notify others if emergency help is needed

Personnel on site must use the buddy system when wearing respiratory protective equipment. Visual contact must be maintained between pairs on-site. Entry team members are to remain close together to assist each other during emergencies.

No "souvenirs" or samples not required for the project are to be collected.

Samples are to be placed in approved containers before they can be removed from the site. Only approved or designated vehicles can be used to transport samples.

Samples are to be left in the staging area. Samples are never to be brought into the office.

Field apparel that had not been decontaminated is not to be worn into the office.

Field samples are to be disposed properly.

Observe all safety signs and do not remove any "lockout tags" or other lockout devices.

Contact with contaminated or suspected contaminated surfaces is to be avoided.

Do not walk through puddles, discolored surface, kneel on the ground, or lean, sit, or place equipment on visibly stained surfaces.

Drums or tanks found on site are not to be opened or moved unless specific drum/tank remediation tasks are specifically included in the SSP and are fully implemented.

Use work schedules that minimize time spent in hazardous areas.

Use work assignments that place employees upwind of sources of air contaminants.

Post the Site Safety Plan, or have a copy readily available, for review by employees. Verify that all personnel have read and signed the SSP.

Notify the SSO of any unsafe acts or conditions or at the first indication that you experience temperature stress or signs and symptoms of possible chemical exposure.

LADDER SAFETY

Ladders pose a significant hazard when improperly used or maintained. There are four causes of accidents involving ladders. They include:

- Improperly securing ladder top and/or bottom
- Structural failure of ladders
- Ascending or descending ladders improperly
- Carrying objectives when ascending or descending ladders

Step Ladders

Step ladders must have positive locking spreaders which will fully spread and lock when the ladder is in use.

- Do not use a step ladder as a straight ladder.
- Do not use the top two steps of a step ladder.
- Do not climb the cross-bracing on the rear side of stepladders.

Straight Ladders

Portable manufactured straight ladders will be used by site personnel. Job-built ladders require special regulations and will not be used by site personnel employees unless approval is given by the Health and Safety Manager.

- When portable ladders are used for access to an upper landing surface, the side rails must extend at least 3 feet above the upper landing surface. The ladder must be secured, and a grasping device, such as a grab rail, must be provided to assist workers in mounting and dismounting the ladder.
- Ladders must be maintained free of oil, grease, and other slipping hazards.

- Ladders must not be loaded beyond the maximum intended load for which they were built, nor beyond their manufacturer's rated capacity.
- Ladders must be used only for the purpose for which they were designed.
- Non-self-supporting ladders must be used at an angle where the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder.
- Ladders must be used only on stable and level surfaces unless secured to prevent accidental movement.
- Ladders must not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement. Slip-resistant feet must not be used as a substitute for the care in placing, lashing, or holding a ladder upon slippery surfaces.
- Ladders placed in areas such as passageways, doorways or driveways, or where they can be displaced by workplace activities or traffic, must be secured to prevent accidental movement, or a barricade must be used to keep traffic or activities away from the ladder.
- The area around the top and bottom of the ladders must be kept clear.
- Ladders must not be moved, shifted, or extended while in use.
- Ladders must have nonconductive siderails if they are used where the worker or the ladder could contact exposed energized electrical equipment.
- Ladders must be inspected by a competent person for visible defects on a periodic basis and after any incident that could affect their safe use.
- Single-rail ladders must not be used.
- When ascending or descending a ladder, the worker must face the ladder.
- Each worker must use at least one hand to grasp the ladder when moving up or down the ladder.
- A worker on a ladder must not carry any object or load that could cause the worker to lose balance and fall.

Other Procedures

- Don't reach beyond a normal arm's length sideways when working on a ladder. A good rule of thumb is to "keep your belt buckle between the side rails." Move the ladder as often as necessary to get close to the work.
- When extending extension ladders, keep your hands on the rails, not the rungs to prevent injuring your hands. Be sure the interlocking guides and connecting mechanisms are set and securely latched.
- Tools should not be left hanging or dangling from ladders or ladder rungs.

FALL PROTECTION

OSHA requires fall protection when the distance from a working surface to a lower level is more than six (6) feet. Fall protection may be required for distances less than six (6) feet if there are obstructions or other hazards present. Site Safety Officer will be responsible for implementing fall protection procedures during field activities.

A fall protection system consists of four components - an anchorage point, a lanyard, a body support, and associated connectors.

Anchorage Point

Anchorage points for fall protection systems must be able to withstand 5,400 lbs static load strength for a 6 ft fall or 3,000 lbs for a 2 ft or less fall. The anchorage point should be directly overhead of the worker to prevent horizontal swing in the event of a fall.

A horizontal lifeline is a cable rigged between two fixed anchorage points on the same level and independent of the work surface. Horizontal lifelines are used when there are no anchorage points above the work area. A horizontal lifeline system requires careful engineering and will not be used without authorization of the Health and Safety Manager.

Lanyards

A lanyard is a short, flexible rope, or strap webbing used to connect a worker's safety harness to the anchorage point. Lanyards should have a minimum strength of 5,000 lbs and absorb the shock of a free fall of 6 ft or less. Shock absorbing lanyards are also available that absorb the energy of a free fall and decelerate the fall of the worker.

It is policy to purchase manufactured lanyards. Home made lanyards or ropes and tire-offs not allowed.

When attaching a lanyard to an anchorage point special crossover straps, or tie off adapters

will be used. These are webbed straps with a D-ring on each end: The strap is looped around a pipe, beam or other anchor and the lanyard is anchored into both D-rings. Looping a lanyard around the anchor and hooking back onto itself is not permitted.

Self-Retracting Lifelines

Self-retracting lifelines are portable devices which are fixed to an anchorage point above a work area and plays out or retracts line automatically as workers move away and toward the device. When a fall occurs, a locking device automatically arrests movement. This type of device should be used in conjunction with tripod/winch devices during confined space entry.

Body Harness

A body harness is a web belt system designed to spread the shock from a fall over the entire body. A full body harness is required for all operations requiring fall protection systems. A body belt which is worn around the waist and chest harnesses are not permitted.

Hardware Connectors

Hardware connectors consist of D-rings, snap-hooks and metal links used to connect fall protection systems together. Connectors should be corrosion-resistant and all surfaces and edges should be smooth to prevent damage to interfacing parts. D-rings and snap-hooks should be able to withstand 5,000 lbs static loads and 3,600 proof tested pounds without cracking, breaking or sustaining distortion.

Use only snap-hooks with a positive locking device or spring loaded keeper which prevents "roll-out" or unintentional release of components.

Additional Requirements

Lifelines, lanyards and harnesses should be protected from sharp edges or cutting edges such as along the edge of "I" beams. A webbing material should be used in these cases.

Knots reduce the strength of ropes, lanyards and cable by as much as 50%. Standard manufactured components will be used and employees will not use knots in fall protection systems.

A lanyard should not be connected to a harness and a deceleration device such as a retractable lifeline since the maximum fall distance of 6 ft maybe exceeded.

When work is performed in an aerial lift device such as a "cherry picker", workers must wear a harness and lanyard. The lanyard should be attached to the lift device bucket. Never attach the lanyard to anything outside the bucket.

Safety belts, lanyards and lifelines must only be used for employee protection. They are never to be used for lifting static loads.

Once used to arrest a fall, the fall protection equipment must be taken out of service and destroyed unless the equipment is inspected by the Site Safety Officer and deemed safe for reuse. Lanyards will always be destroyed after use. The SSO will document that the equipment was inspected and deemed safe for reuse in the field logbook.

Maintenance

Wipe off surfaces of fall protection lanyards, harnesses and connectors to remove gross contamination. Materials can be cleaned with soap and water. A soft brush can be used to scrub the equipment. Hang freely to dry. Do not use solvents or abrasive materials to clean the equipment.

Inspections

The SSO will inspect fall protection equipment each day before use. Document the inspection in field log books.

- Check lanyards for knots, cuts, fraying, chemical degradation. Rotate the lanyard and check the entire surface for damage. Make sure spliced connections are tight and secure.
- Inspect harness for damage including cuts, fraying, and chemical degradation. Make sure buckles and rings are not damaged.
- Inspect hooks for corrosion, dirt, and physical damage. All snap-hooks must fully close and lock. Visually check and physically test the hook. Do not rely on the sound of the hook closing.
- Inspect the tripod for damage. The unit should stand firmly when legs are extended. All bolts should be tight. Winch attachment bolts should be tight. Legs should not be bent and foot pads should be in place. Check winch to make sure ratchet system functions when crank is turned. Pull the line from the winch and make sure brake mechanism works properly.
- All broken, damaged or questionable lifelines, lanyards, harnesses and hooks should be taken out of service and be replaced.

Contact the Office Supervisor, Warehouse Coordinator or Health and Safety Manager if defective parts are found, Do Not Use Damaged Equipment.

NUCLEAR DENSITY GAUGE SAFETY

Personnel who use nuclear density gauges (Troxler gauge) must follow specific procedures and regulations as required by a nuclear material license and the Nuclear Regulatory Commission (NRC). Gauges will be used, transported and stored according to these regulations.

The Troxler Nuclear Density Gauges emit two types of radiation which is a hazard for those working with the gauges.

Gamma Radiation

Gamma radiation is a form of electromagnetic radiation, as are x-rays, radio waves, and visible light. Gamma rays have no mass, zero electrical charge, travel at the speed of light and are much more energetic and penetrating than visible light. The more penetrating gamma rays are able to pass through solids. Gamma rays originate from the product nucleus after radioactive decay and are characteristic of a particular disintegration scheme. The gamma ray emitted after the decay of Cesium-137 to Barium-137 in the Troxler gauges can be stopped by several inches of lead.

Neutron Radiation

Neutron radiation used by Troxler gauges is produced by bombarding beryllium with the alpha particles produced by the decay of Americium-241. The interaction of an alpha particle with a beryllium atom produces an unstable isotope of carbon. The natural decay process that allows the carbon atom to reach a stable state requires the release of a neutron from the carbon nucleus.

The neutron, having no electrical charge, is very penetrating. The problem of shielding against neutrons is twofold: first they must be slowed down, then another material must be used to absorb the slowed neutrons. This slowing process, called thermalization, is best achieved by particles of the same mass as the neutron such as hydrogen. Water as well as other materials with high hydrogen content are ideal thermalizers. Boron and cadmium are particularly good thermal neutron absorbers. Therefore, shielding is accomplished by placing polyethylene, a material with a high hydrogen content, around the neutron source to thermalize the neutrons, allowing them to be absorbed by a thin cadmium sheet covering the polyethylene.

Exposure Limits

Current OSHA allowable exposure limits are 5 rem/year - whole body. The NRC requires that the dose to an embryo fetus during an entire pregnancy be less than 0.5 rem. Women who use nuclear density gauges should declare their pregnancy to the Radiation Safety Officer (RSO) at the earliest possible date so that this exposure limit is not exceeded.

Staff certified to use the Troxler gauges will be issued radiation badges monthly. Montgomery Watson radiation badges measure gamma rays, beta particles, x rays and fast neutrons. Personnel who are not issued radiation badges will not be allowed to use the gauges. Landauer reports of radiation exposure are in millirems. 5,000 millirems = 5 rem annual exposure limit. Each quarter personnel with radiation badges will be given a copy of their exposure record.

PRINCIPLES OF RADIATION PROTECTION

There are three factors that effect radiation exposure:

- Time - The less time a person remains in the area of radiation the less radiation dose received.
- Distance - The intensity of radiation falls off as the inverse square of the distance from the source. By moving twice as far from the source, exposure to radiation is reduced to 1/4 the level. Moving three times as far away reduces exposure to 1/9 the level.
- Shielding - Protective material placed between the user and the source reduces exposure. In the gauges, this is accomplished by keeping the sources in the "locked" or shielded position when not in use.

General Procedures

- Never use or manipulate a gauge without proper training, knowledge, or authorization.
- Wear a radiation badge when working with a gauge.
- Advise other workers to stay clear when the gauge is in use.
- Only the manufacturer should attempt to repair the source, source holder, or shutter.
- Always lock the shutter in the "off" position until maintenance is completed.

- Avoid any physical contact with, or direct exposure to the source when performing maintenance.
- Clean the gauge once or twice a week to prevent dirt from getting near the shutter.
- If necessary, clean the area around the shutter throughout the day if conditions are extremely muddy.
- Make sure the gauges are leak tested every six months.
- Before storing, make sure the source is in the safe position.
- Lock the source and shutter in place.
- Never modify the source holder, shielding, or safety interlocks.
- Store the gauge in its case when not in use.
- Never leave the gauge unattended at a job site.
- Identify the case in case it is lost, damaged or misplaced.
- Lock the area where the gauge is stored.
- When taking a gauge to and from a job site, place it in its case and keep it in an unoccupied part of the vehicle. The case should be locked and chained to the vehicle. The chain should be locked as well.
- Ship according to DOT requirements.

WORKING NEAR WATER

Employees working near water, where a danger of drowning exists will wear U.S. Coast Guard approved life jackets. The SSO will inspect life jackets before and after each use. Defective life jackets will be taken out of service and destroyed. When working from boats or barges ring buoys with at least 90 ft of line will be available for emergency use. A lifesaving skiff will be available when working from barges for rescue purposes.

ELECTRICAL SAFETY

Employees will not perform electrical installations or work on energized electrical equipment where "live" parts are exposed. Energized electrical equipment should be deenergized before performing maintenance.

Electrical Cords

Electrical cords passing through work areas should be covered or elevated to protect the cord from damage and reduce hazards to employees.

Extension cords used with portable tools will be 3-wire type and will be protected from damage when in use. Extension cords must be inspected on a routine basis. Cords with cuts in the insulation or that are worn or frayed or have insulation pulled back from the plug or receptacle fittings will be taken out of service immediately.

Grounding

Portable tools and other electrical equipment will be grounded or double insulated. Ground fault circuit interrupters (GFCIs) will be used in wet areas and on all field sites and outdoor operations. Extension cords used on field sites must always be used in conjunction with GFCIs.

HOT WORK

Hot work involves the use open flames or other sources of heat around possible sources of flammable vapors. Hot work includes:

- Welding
- Burning or cutting with a torch or saw
- Grinding
- Using impact tools that create sparks
- Any other operation that is a potential ignition source in the presence of flammable vapors

These procedures are designed to control sources of ignition and reduce fire and/or explosion hazards of the operations.

Operations defined as hot work outlined above are not allowed unless they are expressly addressed under the scope of work in the health and safety plan. When hot work procedures are permitted under the scope of work, the SSO will be responsible for implementing fire control measures, they include:

- Designating a fire watcher to monitor hot work practices.

- The fire watcher will monitor operations and have a fire extinguisher at the ready for emergencies. The fire watcher will know how to sound an alarm and how to evacuate the area.
 - Fire watchers cannot perform other tasks during hot work procedures.
 - Fire watchers should only try to extinguish fires that are within their capacity.
 - Fire watches should be maintained for at least one-half hour after a welding or cutting operations to detect and extinguish smoldering fires.
- Having the right type and size of fire extinguisher for the job in question.
 - Using air monitoring equipment including combustible gas indicators and oxygen monitors to maintain explosive vapors at safe levels.
 - Using necessary purging/inerting procedures to reduce accumulation of flammable vapors.

UNDERGROUND STORAGE TANK (UST) REMOVAL

The following general procedure will be used for UST removal.

Initial Preparation

- Roads in the work area should be barricaded and caution tape or portable fencing used to limit access to the work area.
- Ignition sources will be removed from the work area. These include smoking, welding, all electrical equipment and internal combustion engines.
- A fire extinguisher of adequate type and size for the operation will be placed within 20 ft of operations.

Product lines should be disconnected and drained and pumps and electrical equipment removed and disconnected. The top of the tank should then be excavated. Tank contents will be removed by pumping with an explosion proof mechanical or pneumatic pump. Product will be placed in 55 gallon drums. The pump lines and hoses should be bonded to the UST and to the 55 gallon drum to prevent build-up of static charges.

Inerting/Purging

One the tanks are empty of free product, they will be inerted by placing dry ice through a fill pipe opening or by pumping nitrogen to the bottom of the tank. At least 1.5 pounds of

dry ice per 100 gallons tank capacity is required. The dry ice should be crushed and evenly distributed (as much as possible) to promote rapid evaporation. As carbon dioxide or nitrogen displaces tank vapors, toxic vapors will be expelled through the vent. All other openings should be sealed to prevent air from entering the tank. Vapors should be vented 12 ft above grade by extending the vent pipe. An organic vapor monitor will be used to measure toxic vapor concentrations in the breathing zone of workers in the area. Oxygen and combustible gases will be monitored during the inerting process. When the oxygen level is less than 5%, the tanks will be excavated and staged for cleaning. (LEL readings will not be reliable when the tank is inerted due to insufficient oxygen for combustion.) Oxygen and LEL should be monitored frequently during all operations to ensure inert conditions are maintained. When taking readings, drop a tube connected to the LEL/Oxygen meter into the tank and measure levels at the bottom, middle and upper tank levels.

An alternative method of purging involves placing an eductor-type air blower driven by an air compressor on the fill (drop) pipe to draw fresh air in through another tank opening. The blower must be installed on the drop pipe so vapors are removed from the bottom of the tank. Fresh air is drawn into the top of the tank at the other opening. The blower must be properly bonded to the tank and grounded to prevent the build-up of static charge.

Cutting

To prepare for opening the tanks, each tank will be grounded by attaching conductive cable to the tank. The other end of the cable will be attached to a grounding rod driven into the ground. An abrasive chop saw or pneumatically driven rivet buster will be used to cut off both ends of the tanks. If the rivet buster is used, two operators are required to man the device. In addition, a fire spotter with the fire extinguisher at the ready is required until the tank cutting operation is completed. For smaller tanks, under 1,000 gallons, the entire end of the tank will be removed creating a square whose corners reach the edge of the tank. For larger tanks the opening must be at least 4 ft by 4 ft to prevent the tanks from being classified as a confined space. Monitor oxygen and LEL levels throughout the process to ensure inert or purged conditions are maintained. Add more dry ice or keep pumping nitrogen into the tank during cutting. If the eductor blower method of purging is used, the blower should be run continuously through the cutting operation.

Cleaning

Once the ends of the tanks are removed, thus eliminating the tank as being classified as a confined space, personnel may enter to perform cleaning operations. Oxygen, LEL and organic vapors must be monitored before entry. If the tank was inerted with dry ice or nitrogen, the eductor blower will now be placed on the tank to purge these gases and bring oxygen levels to the acceptable range. Personnel will don Level C or Level B protection and clean the tank. Level C is used for fuel oils or diesel fuel. Level B is required when entering any tank that contained gasoline due to the possible presence of tetraethyl lead. The eductor blower will be in operation at all times during the cleaning process.

LIFTING/MATERIALS HANDLING

Back injuries are a primary workplace safety problem. Common sense and preplanning can prevent most back injuries.

Material Handling

- Inspect materials for splinters, jagged or sharp edges, burrs, rough or slippery surfaces.
- Grasp the object with a firm grip.
- Keep fingers from pinch and shear points, especially when setting materials down.
- Wipe off greasy, wet, slippery, or dirty objects before handling them.
- Keep hands free from oil and grease.
- Use leather or cloth gloves to protect hands.

Preparation For Lifting and Carrying

Before starting to lift or carry anything, check your entire walkway to make sure your footing will be solid. Your shoes should give you good balance, support and traction.

- Clear any moveable obstacles out of the way, and make sure you know the location of immovable ones.
- Cautiously heft the object to be moved to check its weight and center of gravity.

Lifting Procedure

- Get a firm footing. Keep your feet apart for a stable base; point toes out.
- Bend your knees. Don't bend at the waist. Keep the principles of leverage in mind. Don't do more work than you have to.
- Tighten your stomach muscles. Abdominal muscles support the spine offsetting the force of the load.
- Lift your legs. Let your powerful leg muscles do the work of lifting, not your weaker back muscles.
- Keep the load close. Don't hold the load away from your body. The closer it is to your spine, the less force it exerts on your back.
- Keep your back upright. Whether lifting or putting down the load; don't add the weight of your body to the load.

Safety Tips for Lifting

- Don't lift objects over your head.
- Don't twist your body when lifting or setting an object down.
- Don't reach over an obstacle to lift a load. Move the obstacle or go around it.
- Pace yourself to avoid fatigue when doing heavy work for long periods.
- Use common sense.

Alternative To Lifting

For difficult lifting tasks, keep the following in mind.

- Ask a co-worker for help.
- Use a cart or other material handling device.

Pushing a load is easier on the back than pulling it. When pushing a load:

- Stay close to the load.
- Don't lean forward.
- Use both arms.
- Keep the stomach muscles tight.

If you must pull something:

- Face the object squarely, with one foot at least 12 in. in front of the other.
- Keep your back straight.
- Bend your knees slightly.
- Pull with one smooth motion.

Shoveling

General lifting procedures also apply to shoveling. Use the following procedure:

- Make sure your grip and balance are solid.
- Tighten your abdomen as you lift.
- Keep the shovel close to your body.
- Bend your knees not your back.
- Use the strength of the thighs to bring you to an upright position.

- Increase your leverage by keeping your bottom hand low and toward the shovel blade. This allows you to use the strength of your arms and shoulders instead of your back.

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DECONTAMINATION

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DECONTAMINATION

Everything leaving the exclusion zone must be decontaminated or properly discarded. The exclusion zone is to be defined in the Site Health and Safety plan. All personnel entering the exclusion zone must exit through the decontamination zone. All equipment is to be decontaminated and inspected before it is moved into the support zone. Decontamination solutions are to be appropriate for the hazards. Decontamination solutions are to be changed at least daily and stored on site until disposal arrangements are made. Any material generated by the decontamination procedures will be stored in a designated area in the exclusion zone until disposal arrangements are made.

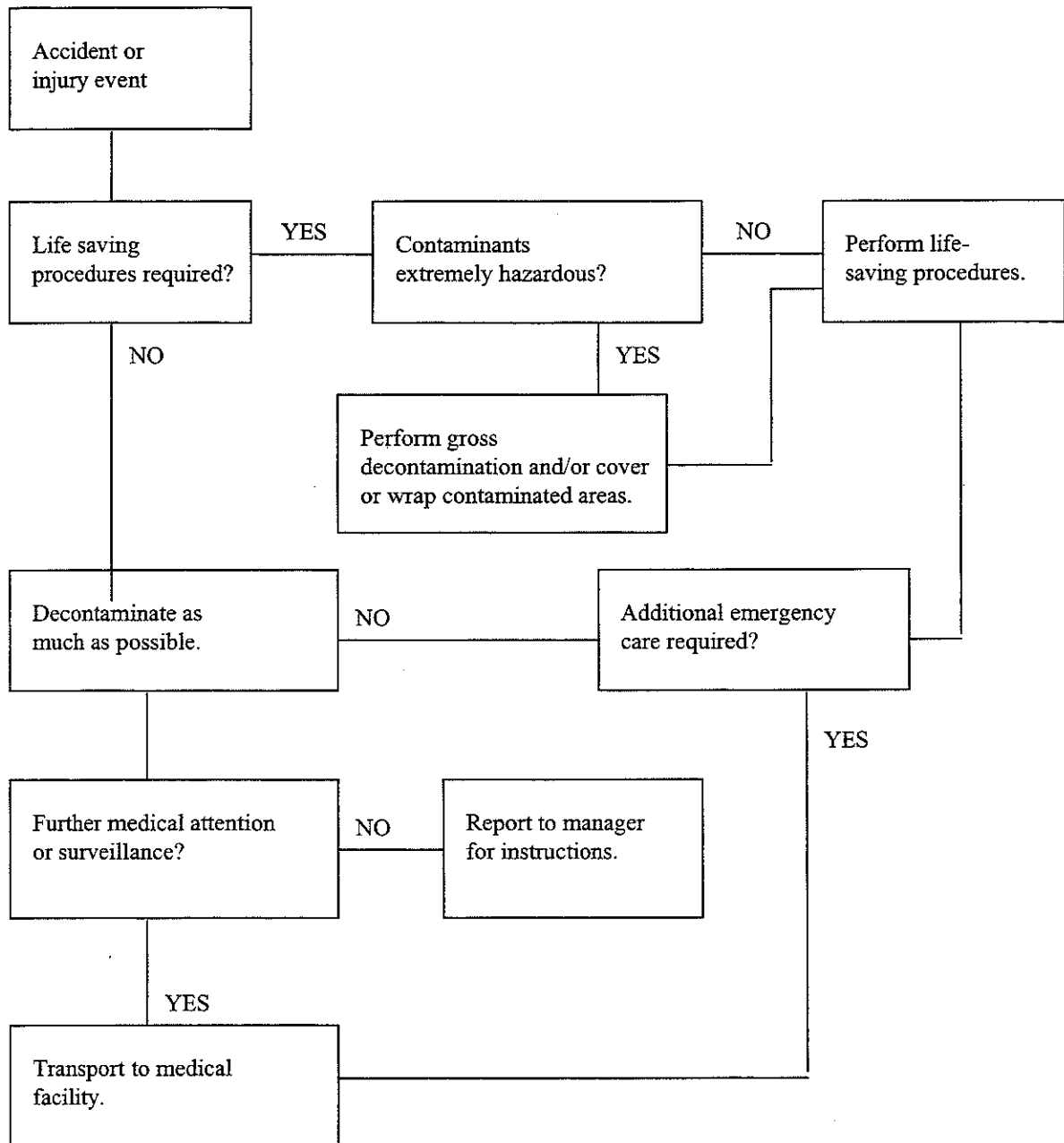
EMERGENCY DECONTAMINATION

The need for emergency decontamination of an individual may arise as the result of:

Injury or illness
Overexposure to chemicals or hazardous substances
Temperature stress

Primary consideration needs to be given to life-preservation actions and the minimization of additional harm or health risks to the individual in the emergency situation and the rescuing individuals.

EMERGENCY DECISIONS



LEVEL B ROUTINE DECONTAMINATION

Equipment Drop

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

Outer Boot/Glove Wash and Rinse

Scrub outer boots/gloves with decontamination solution then rinse with water.

Outer Boot/Glove Removal

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.
- If outer boots/gloves are not disposable, store them in a clean, dry place.

Outer Garment Removal

If using self-contained breathing apparatus (SCBA), remove SCBA back pack and remain on air as long as possible. Remove chemical-protective outer garments and deposit in the appropriate container.

Respiratory Protection Removal

Remove hard hat and face piece, and deposit on a clean surface. Wash and rinse hard hat and face piece. Wipe off and store face piece in a clean, dry location.

Inner Glove Removal

Remove inner gloves and deposit in the appropriate container for disposal.

Field Wash

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

LEVEL B DECONTAMINATION FOR AIR TANK EXCHANGE

Equipment Drop

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

Outer Boot/Glove Wash and Rinse

Scrub outer boots/gloves with decontamination solution then rinse using water.

Outer Boot/Glove Removal

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.
- If outer boots/gloves not disposable, store them in a clean, dry place.

Tank Change

Exchange air tank. Don new outer boots/gloves. Tape joints and return to exclusion zone.

LEVEL C ROUTINE DECONTAMINATION

Equipment Drop

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

Outer Boot/Glove Wash and Rinse

Scrub outer boots/gloves and/or splash suit with decontamination solution then rinse with water.

Outer Boot/Glove Removal

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit in them in the appropriate plastic-lined container.

- If outer boots/gloves are not disposable, store them in a clean, dry place.

Outer Garment Removal

Remove chemical-protective outer garments and deposit them in the appropriate container.

Respiratory Protection Removal

Remove hard hat and respirator and deposit them on a clean surface. Discard respirator cartridges in the appropriate container. Wash and rinse hard hat and respirator. Wipe off and store respirator in a clean, dry location.

Inner Glove Removal

Remove inner gloves and deposit them in the appropriate container for disposal.

Field Wash

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

LEVEL C DECONTAMINATION FOR RESPIRATOR-CARTRIDGE EXCHANGE

Equipment Drop

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

Outer Boot/Glove Wash and Rinse

Scrub outer boots/gloves and/or splash suit with decontamination solution then rinse with water.

Outer Boot/Glove Removal

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.
- If outer boots/gloves are not disposable, store them in a clean, dry place.

Respirator Cartridge Change

Exchange respirator cartridges. Don new outer boots/gloves. Tape joints and return to exclusion zone.

LEVEL D-MODIFIED ROUTINE DECONTAMINATION

Equipment Drop

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

Outer Boot/Glove Wash and Rinse

(Optional, include if necessary for gross decontamination)

Scrub outer boots/gloves and/or splash suit with decontamination solution then rinse with water.

Outer Boot/Glove Removal

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.
- If outer boots/gloves are not disposable, store them in a clean, dry place.

Outer Garment Removal

Remove chemical protective outer garments and deposit them in an appropriate container. Remove hard hat and safety glasses. Decontaminate them as necessary and deposit on a clean surface.

Inner Glove Removal

Remove inner gloves and deposit them in the appropriate container for disposal.

Field Wash

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

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**FIELD EMERGENCY
RESPONSE PROCEDURES**

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FIELD EMERGENCY RESPONSE PROCEDURES

Based on the type of potential hazards that may be present, the Site Safety Officer (SSO) is to determine if a site specific emergency response plan is necessary prior to the beginning of work. If a site specific plan is necessary, it is to be attached to the Site Safety Plan (SSP).

FIRES AND EXPLOSIONS

Even a minor fire can become a serious problem, particularly when adjacent to flammable or combustible materials. The first few minutes after discovery of a fire are the most critical in preventing a larger emergency.

In case of a fire or explosion, immediately turn off burners and other heating devices and stop any work in progress. Give priority to assisting injured persons.

Small Fires

Take the following actions immediately:

- Alert other personnel in the vicinity and send someone for assistance
- If it is a small fire - one that can be extinguished within 30 seconds or with one fire extinguisher - attempt to extinguish the blaze if:
 - Conditions are safe
 - You have the proper type of fire extinguisher
 - You have been trained to use a fire extinguisher properly
 - You are not alone

The combination (ABC) extinguishers can be used against the following classes of fires:

- Class A fires - ordinary combustible solids such as paper, wood, coal, rubber and textiles
- Class B fires - petroleum hydrocarbons (diesel fuel, motor oil and grease) and volatile flammable solvents
- Class C fires - electrical equipment

These extinguishers, however, are not effective against Class D fires which include combustible or reactive metals (such as sodium and potassium), metal hydrides or organometallics. Special Class D extinguishers are required.

Avoid entrapment by a fire; always fight from a position accessible to an exit.

If there is any chance that the fire can not be controlled by locally available personnel and equipment, the following action should then be taken:

- Activate the emergency alarm system (if available) and notify the local fire department.
- Confine the emergency to prevent further spread of the fire.
- Assist injured personnel and provide first aid or transportation to medical aid, if necessary.

Next notify client if the client is in close proximity to the fire. (If not, notify the fire department). Assess the need with the client to contact the fire department. If the fire department is contacted, be prepared to tell them:

- Who you are
- Your location
- Type of fire (i.e., electrical, chemical, combustible solids, vapor)
- If the fire is extinguished
- The need for medical assistance
- Other potential hazards in the area (i.e., proximity to bulk tanks, downed electrical lines, poor access)
- What you will be doing after you hang up the phone and where they can find you or reach you

Upon arrival of the local fire department, brief them of the incident. When given permission, contact the Project Manager (PM) or in the PM's absence, the Office Supervisor or Corporate Health and Safety Manager.

Large Fire or Explosion

If other people are in the area, immediately notify them and then call the local fire department. Be prepared to tell them:

- Who you are
- Your location
- Type of fire (i.e., electrical, chemical, combustible solids, vapor)
- If the fire is extinguished
- The need for medical assistance
- Other potential hazards in the area (i.e., proximity to bulk tanks, downed electrical lines, poor access)
- What you will be doing after you hang up the phone and where they can find you or reach you

Upon arrival of the fire department, turn over command to them and supply as much information as possible. When given permission, contact the PM or in the PM's absence, the Office Supervisor or Corporate Health and Safety Manager. Get a number where they can again be reached.

FLAMMABLE/COMBUSTIBLE LIQUID SPILLS

If a spill of a flammable or combustible liquid occurs, all possible sources of ignition should be extinguished or removed immediately.

Use Material Safety Data Sheets (MSDSs), analytical information from laboratory personnel, and any other available sources of information, together with your own expertise to determine if spill control and clean up can be safely accomplished with the personnel and materials on site.

The following general spill clean up procedures can be utilized, but more specific techniques might be required for certain chemicals.

- Vermiculite or other suitable absorbent may be used to solidify free liquids.
- Both spilled liquids and solids residues must be contained in drums.
- If a spill occurs on soil, it must be scraped and contained.

EVACUATION

Prior to beginning work, the SSO should brief all site employees on what the evacuation signal should be. It may be nothing more than a verbal command or it may be some audible alarm such as a bell or horn. If working at a client's site, familiarize yourself with their warning system.

Prior to work, the SSO should determine a meeting place if evacuation is necessary. Preferably the meeting place should be upwind of the work activities and at a safe distance. All employees should be informed of the meeting location.

If evacuation is necessary, everyone should go directly to the meeting area. The SSO should ensure all personnel are accounted for. This will mean checking the sign-off documentation on the Site Safety Plan or on larger jobs the daily sign-in roster. The local on-scene commander should immediately be notified of any missing personnel as well as their last known whereabouts.

Site Evacuation

If an evacuation of the site is necessary, certain rules must be strictly followed:

- Employees in the vicinity should immediately shut down all equipment and disconnect electrical or flammable power sources to machinery.
- Immediately after personnel are alerted, they will evacuate the facility via the nearest escape route.
- All evacuated personnel will assemble at the predetermined meeting place.
- Employees should not wait for friends; the Site Safety Officer will ensure all personnel have evacuated before departing.
- Employees should move quickly and calmly without panic.
- Employees should not smoke.
- Once assembled, employees should remain calm and quiet while the Site Safety Officer takes roll call and assesses the situation. Each employee must report to the Site Safety Officer until everyone is accounted for and evacuation is complete.

Off-Site Evacuation

If an incident is large enough, off-site personnel may also need evacuation. If off-site evacuation is necessary, follow the appropriate local notification procedures, generally through the fire department. Site personnel should not attempt to evacuate off-site personnel but should leave that task to the local authorities. All site personnel should follow the evacuation directions given by the local authorities. The Site Safety Officer should offer to remain at the command post to supply information. If told to leave, the SSO should leave.

Local authorities will have present an on-scene commander. The on-scene commander will direct emergency operations and will have assistance from the local fire department, police department and emergency government.

After evacuating to a safe area, the PM should be contacted or in the PM's absence, the Office Supervisor or Corporate Health and Safety Manager.

DISCUSSION OF INCIDENT

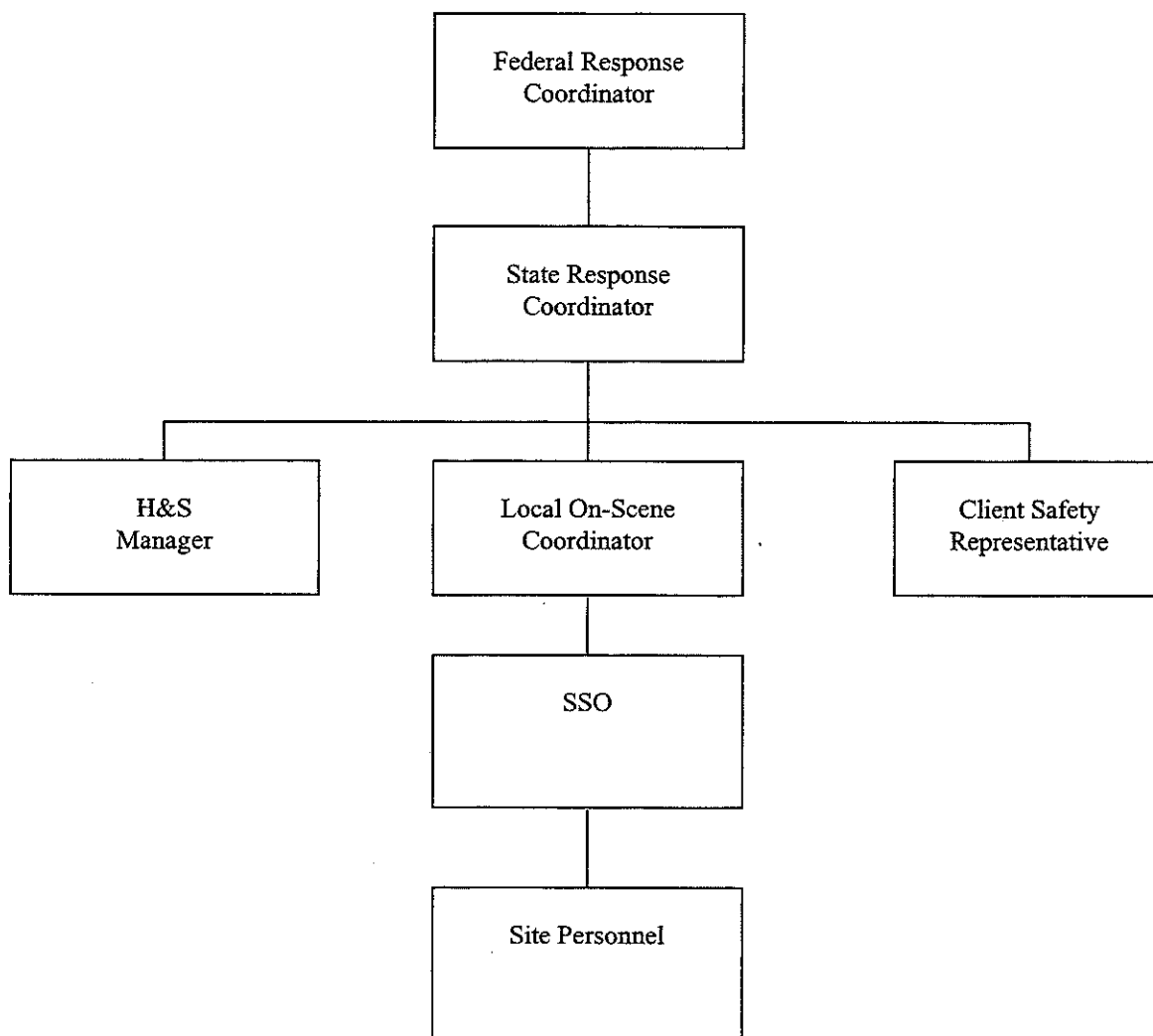
At no time should an employee discuss an emergency incident with members of the media. Politely refuse to discuss the situation and instead, direct all inquiries to the Corporate Health and Safety Manager. Provide the media people with the office phone number.

However, site employees should always provide whatever useful information they can to response personnel. Stick to helpful facts and avoid placing blame or judgement. That will be sorted out later. Politely refuse to find fault or place blame.

At a safe place and at the appropriate time, write down all you remember of the incident. How did it happen? Who was doing what? What did I see? What did I hear? All these types of things may be important later when things are sorted out.

CHAIN-OF-COMMAND

The number of people involved in an incident will be directly related to the severity of the incident. In the event of an incident, the chain-of-command could be as extensive as:



Upon arrival of the local on-scene coordinator or client safety representative, the SSO should turn over command of the situation. The responsibility of the SSO is then to supply information and offer supplies and personnel if requested. It is likely the local on-scene coordinator or client safety representative will not request site personnel but may request site supplies (HNU, absorbent, drums). In a major incident, it is likely the Health and Safety Manager will arrive at the scene. At that time, all responsibilities of the SSO should be turned over to the Health and Safety Manager.

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FIRST AID

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FIRST AID

OPEN WOUNDS

Stop the bleeding by direct pressure, elevation, and if necessary, direct pressure on the supply artery. Do not attempt to cleanse severe wounds. Apply a sterile dry dressing to protect the wound from contamination. Provide shock care. Obtain medical attention.

MINOR BURNS

The object of first aid for burns is to relieve pain, prevent contamination, and prevent shock. First degree and second degree burns should be submerged in cold water until the pain subsides. Gently blot dry then apply a sterile dry dressing as a protective bandage. Do not break blisters, or remove any tissue. Do not use an antiseptic preparation, ointment or spray. Seek medical attention immediately if burns are severe.

EYE INJURIES

Foreign objects are often blown or rubbed into the eyes. Keep victim from rubbing eye. Wash hands before examining eye. Do not attempt to remove foreign objects by inserting toothpicks, or other instruments. If object is embedded in eye, seek medical attention immediately. If object is not embedded try to remove by teardrops, or flushing with water. If object is not easily removed, seek medical attention.

Contusions may be caused by direct blow or explosion. Stop hemorrhage by gently applying direct pressure, then protect eye from contamination with a dry sterile dressing. Seek medical attention immediately.

GENERAL SEQUENCE FOR TREATMENT OF EXPOSURES TO UNKNOWN CHEMICALS

1. Quickly protect yourself from exposure before attempting to rescue the victim.
2. Decontaminate the victim and terminate exposure.
3. Treat cessation of breathing first.
4. If the heart is not beating, perform cardiopulmonary resuscitation (CPR).

5. Treat eye injuries next.
6. Treat skin contact.
7. Treat shock.
8. Call for help.

PRELIMINARY ASSESSMENT

Make a quick assessment of the likely routes of exposure by examining the eyes, mouth, nose and skin of the victim for signs of the chemical itself or damage it has caused such as swelling, redness, bleeding, burns, discharge of fluid or mucous or pallor.

Droping, difficult swallowing, a distended and painful or hard, rigid abdomen all indicate possible ingestion of a corrosive or caustic substance.

If respirations are rapid, shallow, noisy or labored, suspect inhalation.

If the face has been splashed with chemical, eye contact is likely.

POISONING BY INHALATION

Remove the victim from exposure while protecting yourself from exposure.

If breathing has stopped, administer artificial resuscitation using a disposable resuscitator and avoid mouth-to-mouth contact. **DO NOT** use mouth-to-mouth resuscitation if the nature of the chemical exposure is unknown.

Maintain an open airway.

Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.

POISONING BY INGESTION

Remove the victim from exposure while protecting yourself from exposure.

Call a poison control center, emergency room or physician for advice.

Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.

Consult the MSDS to determine whether to offer victim water to drink or to induce vomiting and by what means.

If the victim is conscious:

- Have the victim rinse out mouth with water.
- If there are no signs of burns, swallowing difficulty or abdominal problems and victim is conscious and if so advised by a physician or poison control center:
 - Induce vomiting by giving two teaspoons of Syrup of Ipecac. Follow with at least one cup of water. **DO NOT** use milk. If you do not have Syrup of Ipecac, induce vomiting by asking the victim to touch the back of the throat with a finger, spoon handle or blunt instrument.
 - Have the victim sit up or lean forward while vomiting.
 - Save any vomitus and give it to the emergency medical service personnel to take to the medical facility for analysis.
 - Give the victim one to two cups of water to drink after vomiting has ceased.
- Keep talking to the victim to prevent sleepiness.

If the victim is unconscious:

- Lay the victim on the victim's left side, bending the victim's right hip.
- Maintain an open airway.
- Arrange for transport to the nearest medical facility.
- Stand by to administer artificial resuscitation and CPR if needed. Be sure to wipe or rinse all traces of chemical from in and around the victim's mouth before giving artificial resuscitation. Always use disposable resuscitators supplied in the First Aid kits when performing CPR. **DO NOT** use mouth-to-mouth resuscitation if the nature of the chemical exposure is unknown.
- If breathing has stopped, administer artificial resuscitation using a disposable resuscitator and avoid mouth-to-mouth contact.

If the victim vomits, save the vomitus and send it to the medical facility for analysis.

If the victim shows signs of shock (a weak, rapid pulse; pale clammy skin; cold hands and feet), elevate the victim's feet eight to twelve inches and cover the victim with a blanket.

DO NOT give an unconscious person anything to drink.

DO NOT give someone who is convulsing anything to drink.

POISONING BY SKIN CONTACT

Remove the victim from the contaminated area, being careful to protect your lungs, skin and eyes.

Remove the victim's clothing, shoes and jewelry from the affected areas, cutting them off if necessary. Do this under a shower or while flushing with water.

Continue to flush with water until all trace of the chemical is gone and any slippery feeling has disappeared also. Rinse for at least 15 minutes.

Cover the victim with a blanket or dry clothing.

Notify a physician, emergency room or poison control center of the accident and obtain advice.

In case of inflammation, burns, blisters or pain:

- Loosely apply a dry sterile dressing, if available, or use a clean dry cloth.
- Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.
- If the victim is in a state of shock:
 - Lay the victim down on the victim's side and cover the victim with a blanket.
 - Elevate the victim's feet eight to twelve inches.
 - Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.

DO NOT break open blisters or remove skin. If clothing is stuck to the skin after flushing with water, do not remove it.

DO NOT rub or apply pressure to the affected area.

DO NOT apply any oily substance to the affected skin.

DO NOT use hot water.

POISONING BY EYE CONTACT

Remove the victim from the contaminated area, being careful to protect your lungs, skin and eyes.

Act quickly. Seconds count. Flush the victim's eye(s) with clean tepid water for at least 15 minutes. Have the victim lie or sit down and tilt head back. Hold eyelid(s) open and pour water slowly over the eyeball(s) starting at the inner corners by the nose and letting the water run out of the outer corners. The victim may be in great pain and want to keep eyes closed or rub them but you must rinse the chemical out of the eye(s) in order to prevent possible permanent damage.

Ask the victim to look up, down and side to side as you rinse.

Call an emergency medical service and arrange for transport to the nearest facility for examination and treatment as soon as possible. Even if there is no pain and vision is good, a physician should examine the eye(s) since delayed damage may occur.

If the eye(s) is(are) painful:

- Cover loosely with gauze or a clean, dry cloth
- Maintain verbal and physical contact with the victim

HYDROGEN CYANIDE EXPOSURE

Hydrogen cyanide is a Class A poison which can cause asphyxiation by ingestion, inhalation, or absorption of liquid or vapor through the skin (particularly eyes, mucous membranes, and feet). Hydrogen cyanide has a bitter almond odor and has a threshold limit value-ceiling-TLV-C of 4.7 ppm.

The SSO will notify the local medical facility if the potential for hydrogen cyanide exposure exists at the Site. This will allow emergency personnel to have the necessary equipment in the event of a cyanide exposure emergency.

Signs and Symptoms of Exposure

Inhalation

Very acute poisoning

- Victim cries out before losing consciousness
- Victim falls to the ground
- Wheezing
- Foaming at mouth
- Violent convulsions
- Almost immediate death

Acute poisoning

- Excitement phase
 - Headache
 - Breath smells of bitter almond
 - Dizziness
 - Nausea, occasionally vomiting
 - Rapid breathing
 - Anxiety and excitement
- Depression phase
 - Difficulty in breathing
 - Chest pain
 - Drowsiness
- Convulsion phase
 - Convulsions
 - Jaws clenched together
 - Foaming at mouth
 - Loss of consciousness
- Paralysis phase: If the subject survives, there is a risk of permanent nervous system damage.
 - Deep coma
 - Dilated pupils
 - Weak and irregular pulse
 - Breathing stops
 - Death

Slight poisoning

- Headache
- Dizziness
- Anxiety

- Difficulty in breathing

Ingestion

(See symptoms described under Inhalation - Acute to slight poisoning)

Burning tongue and mouth

Salivation

Nausea

Skin contact

The gaseous and liquid compounds are quickly absorbed by the skin and cause symptoms described under INHALATION, resulting in acute to slight poisoning. Depending on their nature, they can be very or only slightly irritating.

Splashing in eyes

Irritation and watering of eyes

When absorbed by mucous membranes of the eyes, these compounds can cause the same symptoms described in INHALATION, resulting in slight poisoning.

First Aid

Inhalation

Remove the victim from the contaminated area only after protecting yourself from exposure.

Have someone call the Emergency Medical Service and arrange for transport to a medical facility. Inform them of the nature of the exposure.

Remove contaminated clothing and equipment while wearing appropriate protective clothing.

If the victim has stopped breathing:

- Open airway, loosen collar and belt. Do not use direct mouth-to-mouth resuscitation for cyanide exposure. A bag-valve mask is required.
- Check the pulse.
- Continue your efforts until help arrives or the victim starts to breathe on their own.
- Keep the victim warm and quiet.

If the victim is unconscious but breathing:

- Lay the victim on their back. If the victim is vomiting, turn the head to the side.

- Clear the airway and loosen tight clothing.
- Keep victim warm and quiet.
- Do not leave the victim unattended.
- Never give an unconscious person anything to drink.

If the victim is conscious:

- Lay the victim down, cover the victim with a blanket and keep them quiet.
- Loosen tight clothing.

Ingestion

Start lifesaving treatment, call for help and, if possible, empty the stomach and prevent further injury caused by absorption. **PROMPT TREATMENT IS LIFESAVING.**

- Ask someone to call a poison control center, inform them of the chemical swallowed and follow their advice.
- Ask someone to call the Emergency Medical Service and arrange for transport to a medical facility.

If the victim is unconscious or unresponsive:

- Lay the victim on the left side and loosen the victim's collar and belt.
- Check the airway for obstruction.

If the victim stops breathing, administer artificial respiration using a bag-valve mask. Do not use direct mouth-to-mouth resuscitation.

If the victim is conscious and alert:

- Remove the victim from the contaminated area to a quiet, well ventilated area.
- Loosen tight clothing around the neck and waist.
- Have the victim rinse mouth several times with cold water and spit out.
- Give him 1 or 2 cups of water or milk to drink.
- Induce vomiting by touching the back of the throat with your finger, a spoon handle or a blunt object.
- Have the victim sit up and lean forward while vomiting.
- Save vomitus for analysis later. Avoid skin contact with it.

- Do not leave the victim alone.

DO NOT give an unconscious person or a person who is having a convulsion anything to drink. **DO NOT** give alcohol, drugs, or stimulants like tea or coffee. **DO NOT** continue to try to induce vomiting in someone who doesn't gag when you touch the back of his throat.

Skin contact

Remove the victim from the source of contamination and take them **IMMEDIATELY** to the nearest shower or source of clean water. Remove clothing, shoes, socks and jewelry from the affected areas as quickly as possible, cutting them off if necessary. Be careful not to get any of the chemical on your skin or clothing. Wash the affected area under tepid running water using a mild soap. Thoroughly rinse the affected area with tepid water. Dry the skin gently with a clean, soft towel. Notify a physician, emergency room, or poison control center and inform them of the nature of the substance and the accident. Arrange for transport to the nearest medical facility. Do not leave the victim alone. Watch for signs of systemic toxicity.

If the skin is inflamed or painful, put the painful part in cold water or apply cold wet dressings on the burned area.

Eye contact

Remove all the chemical from the eye(s) quickly. Remove the victim from the source of contamination and take them to the nearest eye wash, shower, or other source of clean water. Gently rinse the affected eye(s) with clean, lukewarm water for at least 15 minutes. Have the victim lie or sit down and tilt their head back. Hold the eyelid(s) open and pour water slowly over the eyeball(s) at the inner corners, letting the water run out the outer corners. Ask the victim to look up, down and side to side as you rinse in order to better reach all parts of the eye(s). Have the victim remove contact lenses if they are wearing them. Arrange for transport to the nearest medical facility for examination and treatment by a physician as soon as possible. Tell the Emergency Medical Service personnel the name of the chemical and the nature of the accident. Even if there is no pain and vision is good, a physician should still examine the eye(s) since delayed damage may occur. If the victim cannot tolerate light, protect the eye(s) with a clean, loosely tied handkerchief or strip of clean, soft cloth or bandage. Be sure to maintain verbal communication and physical contact with the victim.

DO NOT let the victim rub eye(s). **DO NOT** let the victim keep eyes tightly shut. **DO NOT** introduce oil or ointment into the eye(s) without medical advice. **DO NOT** use hot water.

In all instances when performing First Aid procedures personnel should follow guidelines for Bloodborne Pathogens. Use the PPE - gloves, disposable mouth-to-mouth resuscitators, safety goggles and overgarments supplied in First Aid kits. Report all First Aid incidents to the Health and Safety Manager immediately.

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CONFINED SPACE ENTRY

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CONFINED SPACE ENTRY

DEFINITION OF CONFINED SPACE

A confined space is defined as an enclosed space which meets all of the criteria below:

- Is large enough that a person can enter it and perform assigned work
- Has a limited means for exit or entry such as a tank, vessel, silo, storage bin, hopper, vault, pit, trench, or diked area
- Is not designed for continuous human occupancy
- Meets any of the following criteria:
 - Contains or has a known potential to contain a hazardous atmosphere
 - Contains a material with the potential for engulfment of an entrant
 - Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or a floor which slopes downward and tapers to a small cross-section
 - Contains any other recognized serious safety or health hazard

If you can not enter and exit an enclosed space by walking into and out of it in an upright manner, it has a limited means of exit/entry and may be a confined space. Open-top spaces which require the use of ladders, hoists or other devices for exit may be confined spaces.

Spaces designed to store product, enclose materials and processes, or transport products or substances can be confined spaces. They are generally not designed for persons to enter and work in them on a routine basis though they may have limited access for occasional worker entry for inspection, maintenance, repair, cleanup, etc.

A trench is defined as a narrow excavation made below* the surface of the ground. In general, the depth is greater than the width, but the width of a trench, measured at the bottom, is not greater than 15 feet.

An excavation less than five feet deep with no potential for cave-in does not need the protection requirements (sloping, shoring, etc.) required by OSHA in its Excavation Regulations, but it might still be considered a confined space. OSHA requires air monitoring for entry into excavations over 4 ft deep if there is a potential for encountering

hazardous atmospheres. If excavations are less than 4 ft deep and personnel are kneeling or performing work requiring them to bend over, air monitoring is still required because their heads are below the ground surface and gases heavier than air may accumulate in these areas.

REQUIREMENTS FOR CONFINED SPACE ENTRY

Do not enter any confined spaces which:

- Have oxygen levels below 19.5% or more than 23.5%
- Have flammability greater than 10% LEL
- Contain toxic substances with concentrations that are above the IDLH concentration.

In situations where all of the above conditions are met, personnel will wear appropriate respiratory protection when toxic substances have concentrations above the TLV but less than the IDLH level. Complete permit required confined space entry procedures (Option #2 later in this SOP) will be implemented if respiratory protection must be worn during entry.

CONFINED SPACE ENTRY LIMITATIONS

The SSO is to allow entry into confined spaces only if all of the following criteria are met:

- The Site Safety Plan addresses confined space entry under the scope of site activities.
- The Health and Safety Manager has reviewed and signed the Site Safety Plan.
- The Health and Safety Manager has issued a Confined Space Entry permit to the SSO if Option #2 - Permit Required Confined Space Entry - is used.
- No other non-entry procedure can be used to complete the necessary work.
- There is no danger of engulfment.
- The atmosphere can not become IDLH.
- The atmosphere is tested before initial entry and continuously during the course of entry.

PROCEDURES

General

If a site contains confined spaces, the SSO will inform employees at the daily site safety meeting of the locations of the confined spaces. In addition all confined spaces will be posted with a sign reading "DANGER - PERMIT - REQUIRED CONFINED SPACE, DO NOT ENTER".

If personnel will not be entering the confined spaces during the course of the field project, the SSO will take effective means to prevent personnel from entering the confined spaces. These may include locking or barricading the entrance to the confined space.

The SSO will implement all necessary measures as indicated in this plan and will be responsible for health and safety aspects at the job site during confined space entry.

If personnel must enter the confined space as specified in the Site Safety Plan, they can do so under one of two options. The Site Safety Plan will specify the option to be used.

Determination of Confined Space Entry Options

The Health and Safety Manager will determine the necessary measures and precautions necessary to conduct confined space entry in a safe manner. There are two possible options for conducting entry.

Option #1 General Requirements:

- Requires no attendant
- Requires no permits
- Requires no additional rescue provisions other than those in the Site Safety Plan
- Requirements of Confined Space to meet Option #1:
- Only hazard is actual or potential hazardous atmosphere
- Ventilation alone is sufficient to maintain safety during entry
- No hot work, use of solvents or other hazardous materials is allowed in the space
- Work outside the space cannot produce hazardous vapors that will enter the space
- Sanding, scraping and loosening residue cannot be performed if hazardous vapors are generated

- Forced ventilation alone will maintain safe conditions during entry

Option #2 Permit Required Confined Spaces General Requirements:

- Requires Confined Space Entry Permit
- Requires attendant
- Requires special rescue provisions

Conditions that Require Use of Option #2:

- Hazards are "unknown"
- Hazards cannot be controlled by ventilation alone
- Respiratory protection is needed to keep exposure below permissible exposure limits
- Hot work or use of solvents or other hazardous materials is required in the confined space
- Sanding, scraping and loosening of residue may release hazardous vapors

Guarding of Street Openings

When the entrance to a confined area is located in a street, the vehicle's beacon and 4-way flashers shall be activated upon approach to the area.

Vehicles shall be parked in such a way that traffic will flow in an unobstructed manner, and where possible, the vehicle shall provide protection of workers.

Vehicles shall be parked in such a manner that exhaust fumes cannot accumulate in the confined area. If this is not possible, the vehicle's exhaust stack shall be extended away from the confined area.

- **Cone Placement.** Before uncovering a manhole, traffic safety cones shall be placed around the manhole and any vehicle, and shall be visible to traffic in all directions. Cones shall be placed to protect the workers and to channel traffic flow. Cones shall be placed at sufficient distances and intervals in accordance with local traffic ordinances, to adequately warn oncoming traffic.
- **Additional Safety Signals.** In areas of high traffic volume or other sites warranting additional warning devices, illuminated traffic arrows, barricades, and "Men Working" signs shall be used.

When placement of the vehicle creates a situation of having only one open lane of traffic in a congested area, a flagman shall be used to direct traffic flow.

Traffic safety vests or equivalent shall be worn at all times when working on the street or easement surface in the field.

Air Quality

Workers shall be properly equipped and trained to recognize, understand and control air quality hazards that may be encountered in confined areas.

Sampling of the atmosphere throughout every confined area shall be performed by the SSO before entry. The air quality shall be determined for all levels and all areas of the confined space.

A sampling meter with audible or visual warning devices, or both, which simultaneously incorporates tests for oxygen deficiency and combustible gases shall be provided and used to test the atmosphere of the confined area. Hydrogen sulfide may be monitored as well in certain situations.

Oxygen Deficiency

Calibration of the sampling meter shall be performed each day by the SSO where the air is most likely to contain the natural 20.9% oxygen.

When sampling the atmosphere of a confined area, a nonsparking probe shall be used. For manholes the probe shall be inserted through the pick-hole of the manhole cover, or the cover shall be pried open on the downwind side to allow just enough room for insertion of the probe.

A confined area shall not be entered if the oxygen content is less than 19.5% or greater than 23.5%.

Combustible Gases

The meter shall be zeroed and calibrated each day by the SSO with a standardized combustible gas supply.

A confined area shall not be entered if the sampling meter indicates 10% or more of the Lower Explosive Limit, L.E.L.

Hydrogen Sulfide

The sampling meter shall be zeroed and calibrated each day by the SSO with a standardized hydrogen sulfide gas supply.

A confined area shall not be entered if the sampling meter indicates 10 ppm or more of hydrogen sulfide.

Organic Vapors

Organic vapors may be monitored if they are suspected of being present in the confined space.

A confined area shall not be entered if testing indicates the presence of toxic materials in excess of IDLH levels. If levels are less than the IDLH level but above the permissible exposure level, appropriate respiratory protection as specified in the Site Safety Plan will be worn.

Adequate Air Quality. Entry to a confined area shall be made only after sampling indicates adequate air quality in accordance with the limits specified above.

Continuous monitoring of the atmosphere shall be conducted in the worker's immediate area while in the confined area.

Monitoring shall be achieved by a surface instrument or one worn on the worker's belt.

Signals from the monitoring instrument shall immediately indicate when workers are to exit the confined area.

Forced ventilation may not be used in lieu of air quality measuring devices.

OPTION #1 - WORK PROCEDURE

If the confined space only poses the hazard of an actual or potential hazardous atmosphere and ventilation alone is sufficient to maintain safety during entry, this option can be used. The Health and Safety Manager will review operations and associated hazards, chemical data and physical characteristics and will determine if this option is acceptable and will specify in the Health and Safety Plan the necessary measures to implement this option. The Health and Safety Manager must be notified before this option can be initiated.

If an initial entry into the space is required to determine the state of the confined space or eliminate hazards, Option #2 (Permit Entry) must be used. All confined spaces will be considered permit required confined spaces until the SSO has evaluated and demonstrated otherwise.

The SSO will determine if this option meets the requirements below and will document and certify that they have done so.

The following procedure will be used for Option #1 confined space entry.

Any conditions making it unsafe to remove an entrance cover shall be eliminated by the SSO before the cover is removed.

These conditions may include:

- High temperature
- High pressure

The cover should be checked to see if it is hot and it should be loosened slowly to gradually reduce residual pressure.

When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each person working in the space from foreign objects entering the space.

Before personnel enter the space, the internal atmosphere shall be tested, with a calibrated direct-reading instrument, for the following conditions in the order given:

- Oxygen content
- Flammable gases and vapors
- Potential toxic air contaminants

There may be no hazardous atmosphere within the space whenever any worker is inside the space.

Continuous forced air ventilation shall be used as follows:

- Personnel may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere.
- The forced air ventilation shall be so directed as to ventilate the immediate areas where personnel are or will be present within the space, and shall continue until all personnel have left the space.
- The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space.

The atmosphere within the space shall be monitored continuously to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere.

If a hazardous atmosphere is detected during entry:

- Personnel will exit the space immediately.
- The Health and Safety Manager will be contacted immediately.
- The space shall be evaluated to determine how the hazardous atmosphere developed.
- Work will continue under Option #2 - Permit Required Confined Spaces or as directed by the Health and Safety Manager.

The SSO shall verify that the space is safe for entry and that the measures required above have been taken, through a written certification that contains the date, the location of the space, and the signature of the person providing the certification. The certification shall be made before entry and shall be made available to each employee entering the space.

OPTION #1 - ENTRY CERTIFICATION

Date: _____

Location of Space: _____

I hereby certify that the confined space identified above is free from atmospheric hazards as well as physical hazards and that personnel may enter as required above. I have contacted the Health and Safety Manager before implementing this option.

SSO Signature: _____

SSO Name (Print): _____

OPTION #2 - WORK PROCEDURE

Option #2 requires the full implementation of the confined space permit program. This option will be used when:

- Confined space hazards cannot be controlled through ventilation alone.
- The confined space contains hazards that cannot be eliminated without first entering the confined space.
- The confined space has hazardous vapors in concentrations greater than the TLVs but not greater than IDLH levels.

- In "unknown" situations where there is insufficient information about the nature of hazards in a confined space to implement Option #1.
- Hazards arise while working under Option #1.

The following procedure will be used for Option #2 confined space entry.

- The SSO will direct and supervise confined space entry procedures.
- A Confined Space Entry Permit will be issued by the Health and Safety Manager. The top part of the form will be completed by the Health and Safety Manager which will stipulate the necessary equipment and safety measures necessary to proceed with the entry. The SSO will complete the bottom portion of the permit prior to time of entry. The SSO will post the completed permit at the entrance of the confined space during time of entry. After completion, the original white copy is to be forwarded to the Health and Safety Manager.
- The SSO will obtain the necessary air monitoring equipment, personal protective equipment, rescue equipment and other materials as required by the site safety plan and entry permit.
- The SSO will contact the local rescue service as indicated in the site safety plan and inform them of the location of the site, dates/times of entry, hazards that may be confronted and any other pertinent information requested by the rescue service so they can develop the appropriate rescue plan in the event of an emergency.
- The SSO will complete the permit and certify that all conditions are met before proceeding with entry.
- The maximum duration of a permit will be 8 hrs. New permits must be completed at the beginning of each day and at the end of the 8-hr period if work progresses beyond a normal 8-hr day. The SSO may determine that a more frequent permit completion schedule is warranted due to site conditions or changes in personnel or procedures.
- The SSO will hold a pre-entry meeting with all personnel involved with the confined space entry. The meeting will include the procedures that will be used, hazards and safety precautions necessary to conduct the entry in a safe manner. Safety equipment, communications, work practices emergency procedures and personnel roles and responsibilities will be discussed.
- The SSO will use lock-out tag-out procedures to eliminate hazards associated with electrical energy, pneumatic energy, hydraulic energy, steam lines, inlet lines or any other physical hazards.

- Before personnel enter the space, any conditions that make it unsafe to remove the entrance cover will be eliminated by the SSO. These may include high temperature or pressure.
- When entrance covers are removed, the opening will be promptly guarded by the designated attendant.
- Before entry by the authorized entrant(s), the SSO will monitor the space for oxygen, LEL and toxic vapors as specified on the permit and in the health and safety plan. The SSO will monitor from outside the space.
- Monitoring shall be performed every 4 ft down and 4 ft laterally to check for stratified hazardous atmospheres.
- If levels of oxygen are less than 19.5% or greater than 23.5%, flammability is greater than 10% LEL, or the space contains substances with concentrations greater than IDLH level, forced air ventilation will be used to purge the space. The SSO will perform air monitoring to see that the ventilation is adequately reducing the air hazards. Personnel are not to enter the space until oxygen is between 19.5% and 23.5%, LEL is less than 10% and toxic substances have concentrations below the IDLH level.
- Forced ventilation should be directed toward the work area and will be used constantly during times of entry.
- If air monitoring reveals toxic substance concentrations in excess of the TLVs, the SSO will direct entrants to don the proper level of protection as indicated in the Site Safety Plan.

Under no circumstances shall a person enter a confined area without another person standing by at the entrance.

A person entering a confined area shall have voice or other means of communication to persons outside the confined area at all times.

Prior to entry to a manhole or top entry to a confined area, a winch shall be set up for rescue purposes.

A person entering vertically into a confined area shall wear a full-body harness secured to a life line. The harness shall have a waist belt, shoulder straps, leg straps and a ring attached no lower than the shoulder blades. The life line shall be attached to the winch drum which will be used for emergency retrieval. The attendant will initiate rescue by using the winch in an emergency.

TRAINING

The following outlines the minimum topics that must be covered in annual confined space entry training for the types of individuals noted.

All Employees Who May Be Required to Enter Confined Spaces in the Course of Their Employment

- Procedures and control for entry
- Emergency action plan
- Hazard recognition
- Nature of hazards
- Testing to be performed to determine if it is safe to enter
- Toxic effects and symptoms of exposure to anticipated hazardous materials via absorption, inhalation and/or ingestion
- Use of personal protective equipment including respirators and clothing, required for entry or rescue and barriers or protective shields
- Self-rescue
- Evacuation requirements
- Modifications of normal work practices that are necessary for confined space work

Persons Authorizing/In Charge of Entry, Site Safety Officers

- All of the requirements noted for employees who may be exposed to permit entry of confined spaces in the course of their employment
- Recognition of the effects of exposure to hazards reasonably expected to be present
- Duties outlined in this section

Attendants

- Emergency action plan
- Proper use of communications equipment furnished to communicate with entrants or summon emergency/rescue services

- Authorized procedures for summoning emergency/rescue services
- Recognition of early behavioral signs of intoxication caused by contaminants whose presence could be anticipated in the space
- Duties outlined in this section

INDIVIDUAL RESPONSIBILITIES

Health and Safety Manager

Provide annual training as outlined in this section. Review all Site Safety Plans requiring confined space entry. Issue Confined Space Entry Permits. Review completed permits annually.

Site Safety Officers

Review Site Safety Plan to confirm that the identity of each confined space on site has been noted. Post "Danger - Permit - Required Confined Space, DO NOT ENTER" signs.

Allow entry into confined spaces only if all of the following criteria are met.

- Confined space is not classified as IDLH.
- Oxygen is between 19.5% and 23.5%.
- Flammability is less than 10% LEL.
- No other non-entry procedure can be used to complete the necessary work.
- There is no danger of engulfment.
- The atmosphere can not become IDLH.
- The atmosphere is tested before initial entry and continuously during the course of entry.

Do not permit non-attendant permit confined space entries (under Option #2).

Prior to the start of site activities:

- Inform site workers of the location of each confined space to prevent inadvertent entry.

- Assure the availability and use of all personal protective equipment and clothing necessary for safe entry.
- Assure that rescue and safety related equipment, such as lifting or retrieval devices, are readily available prior to entry. Provide for and require the use of retrieval lines, or equivalent equipment, to make non-entry rescues possible.

Provide appropriate vehicle and pedestrian guards, barriers, or other means to protect the entry party and attendants from local traffic hazards and to protect non-entering employees from hazards arising from the confined space.

Do not authorize or allow employees who have not been trained in permit entry of confined spaces to enter any confined space.

All personnel entering permit confined spaces (Option #2) must wear a safety harness with a life-line which is attached to a mechanical retrieval device if the space is over 5 ft deep and the space is a vertical type confined space.

Determine actual and potential hazards associated with the space at the time of entry. Choose the appropriate means to execute a safe entry.

Assure all necessary control measures are completed:

- Isolation (i.e., lock-out, blanking, disconnections, etc.)
- Space preparation (i.e., cleaning, purging, inert atmosphere in place, etc.)

Assure, by appropriate testing, that the control measures used are effective.

Assure proper calibration of test and/or monitoring equipment.

When testing atmospheres, measure every 4 ft down and 4 ft laterally to check for stratified hazardous atmospheres.

Determine and evaluate the source (e.g., residue to be removed from space, leaking valve or pipe in space) of any atmospheric contamination found at the time of entry.

Provide an attendant for each permit entry of a confined space.

Complete the bottom portion of the "Confined Space Entry Permit".

Verify that the necessary pre-entry conditions exist. Record conditions and measured atmospheric gas levels on the "Confined Space Entry Permit".

Verify that an on-site rescue team is available if it is to be used.

Verify that the means for summoning the on-site rescue team or other emergency assistance is operable.

Complete all portions of "Confined Space Entry Permit". Assure that pre-entry and authorizing signatures portions of the permit are completed before any employee enters a confined space.

Terminate the entry upon becoming aware of a non-permitted condition.

May serve as attendant.

Send the completed white copy of the Confined Space Entry permit to the Health and Safety Manager.

Attendant

Remain outside the confined space. Under no circumstances is the attendant to enter the confined space, even in an emergency, until help arrives. Do not leave for any reason while entry continues, except for self-preservation, unless replaced by a qualified individual.

Maintain continuous communication with all authorized entrants within the confined space by voice, radio, telephone, visual observation or other equally effective means.

Order entrants to exit the space at the first indication of a non-permitted condition, unexpected hazard, indication of a toxic reaction, unusual conduct of entrants, external situation that could pose a hazard to the entrants.

Know the procedure and have the means to summon immediate emergency assistance.

Do not allow anyone to enter the confined space to affect a rescue unless that person is wearing appropriate PPE, including a safety harness with lifeline and the necessary respiratory protection.

Warn unauthorized persons not to enter, or to exit immediately if they have entered.

Assist in handling tools and materials, relaying messages, prevent fouling of air hoses and lifelines in use.

Perform non-entry rescues when using emergency retrieval device.

AUTHORIZED ENTRANTS

Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.

Properly use equipment as required.

Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space as required.

Alert the attendant whenever:

- The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or
- The entrant detects a prohibited condition
- Exit from the permit space as quickly as possible whenever:
 - An order to evacuate is given by the attendant or the entry supervisor
 - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation
 - The entrant detects a prohibited condition
 - An evacuation alarm is activated.

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EXCAVATIONS

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EXCAVATIONS

Excavations pose two primary hazards to employees working in them. The first is cave-in of the sidewalls or sudden movement of soils which can entrap, bury or injure workers. The second hazard is associated with hazardous gases that are heavier than air which may accumulate in trenches or excavations and cause oxygen deficient conditions, explosive environments or be at concentrations that are hazardous.

TRENCH

A narrow excavation made below the ground in which the depth is greater than the width - the width not to exceed 15 ft.

EXCAVATION

Any man-made cut, cavity, trench or depression in the earth's surface formed by earth removal.

Causes of Cave-ins

- **Soil Type** - Loose-grained sandy soils have little cohesive strength and are not self-supporting. Clays and silts tend to stick together and be self-supporting.
- **Moisture** - Water affects soil particle cohesiveness. Too much water affects the ability of soils to stick together allowing them to slide and move more easily. Too little water results in drying and cracking which allows soils to collapse.
- **Recent Excavations** - Soil that has never been disturbed is stronger than soil that has been previously disturbed.
- **Freezing and Thawing** - When water freezes, it expands, and when ice thaws, it contracts. Movement of soil and shoring materials can result from the expansion and contraction during freeze-thaw cycles.
- **Surcharged Loads** - Construction materials, heavy equipment and the weight of spoils piles all contribute to the downward force on soil. The greater the surcharged load, the less stable the soil will be.
- **Shock and Vibration** - Moving trains, highway traffic, pile driving and blasting are all source of vibration which can weaken the cohesiveness of soil.

- **Intersecting Trenches** - The point formed by the intersection of two trenches is particularly vulnerable to collapse if not properly protected.

WORK PRACTICES

Standard Montgomery Watson protocol is to not go into any excavation or trench if there is another work practice or engineering control that can be used to eliminate the need for entry. These include:

- Using a backhoe to collect soil samples from the base or sidewalls of an excavation.
- Assembling piping and other apparatus outside an excavation and then laying it in the excavation by remote means.
- Collecting air quality measurements by lowering a sampling line into the excavation.
- Conducting and documenting soil classification by taking pictures or by taking notes from outside the excavation.

If personnel must enter an excavation in the course of field activities, the SSO will act as the OSHA specified "competent person". No personnel is to enter the excavation until the competent person inspects the excavation and determines conditions are safe for entry. When subcontractors are to perform excavation activities, the subcontractor will provide the competent person and perform necessary inspections and controls to conduct work in a safe manner. The SSO will monitor the subcontractors excavation activities and will ensure that the subcontractor corrects any deficiencies in the excavation or trenching operation that are noted.

The SSO (competent person) will keep detailed notes of the excavation inspections and determinations that conditions are safe for personnel to enter the excavation. The competent person will complete the Excavation Safety Checklist and inspect excavations at least daily. The inspections will include:

- Excavations
- Adjacent areas
- Protective systems
- Indications of possible cave-ins or protective system failure
- Hazardous atmospheres
- Any other hazardous conditions

Inspections shall be made again after every rainstorm or other hazard increasing occurrence.

When the competent person finds evidence of a condition that could result in possible cave-in, failure of protective systems, hazardous atmosphere or other hazardous condition, the hazards must be corrected before anyone is allowed to enter the excavation.

GENERAL REQUIREMENTS

The competent person shall inspect and ensure the following safeguards are in place during excavation operations.

- All surface encumbrances that create a hazard shall be removed, supported or safeguarded.
- Underground utilities such as sewer, telephone, fuel, electric, water lines or any other installation will be cleared before opening an excavation.
- While the excavation is open, underground utilities will be supported, protected or removed to safeguard workers.
- A means of egress must be located every 25 ft laterally along trenches 4 or more feet deep.
- Workers exposed to vehicular traffic must wear warning vests.
- Workers must not be permitted to work underneath loads handled by lifting or digging equipment.
- When mobile equipment is operated adjacent to an excavation or must approach the edge of an excavation, a warning system such as barricades, hand or mechanical signals, or stop logs must be used to prevent the equipment from falling into the excavation.
- When hazardous atmospheres exist or could reasonably be expected to exist in excavations, the competent person will perform air monitoring as specified in the Health and Safety Plan. Confined Space Entry procedures will be implemented during entry into excavations with hazardous atmospheres.
- Emergency rescue equipment, such as breathing apparatus, a safety harness and line will be available where hazardous atmospheric conditions exist or may reasonably be expected to develop during excavation work.

- Workers are not to work in excavations with accumulated water. Water removal equipment should be used as necessary and diversion ditches, dikes or berms used to direct surface runoff away from excavations.
- Excavations below the base of footings, foundations or walls are not permitted unless a support system designed by a professional engineer is in place.
- Sidewalks, pavement and other structures will not be undermined unless a support system is provided.
- Workers must be protected from loose rock or soil that poses a hazard by falling or rolling from an excavation face.
- All excavated soil piles, equipment and other materials must be at least 2 ft from the edge of excavations to prevent them from falling into the excavation.
- Walkways and bridges over excavations must be equipped with guardrails.
- Adequate barriers must be installed around excavations or they must be barricaded to protect workers and the general public from fall hazards.

CAVE-IN PROTECTIVE SYSTEMS

The competent person will ensure that all workers in excavations be protected from accidental wall collapse. Protective measures are not required when:

- Excavations are made entirely in stable rock.
- Excavations are less than 5 ft deep and the competent person inspects the excavation and determines there is no potential for cave-in.

If excavations are over 5 ft deep or under 5 ft deep and there is a potential for cave-in, sloping, shoring or bracing is required to protect workers during entry into the excavation. There are three protection options. They are:

1. Slope the sides of the excavation no steeper than one and one-half horizontal to one vertical (34 degrees measured from horizontal).
2. Determine the slopes of the sidewalls based on soil classification.
3. Have a professional engineer design a protective system or select, a shoring or bracing system. This option requires a written copy of the design plan to be at the site.

When support systems are in place, materials are not to be excavated more than 2 ft below the bottom of the support and they must be installed and removed in a safe manner so workers involved with these operations are protected from collapse and cave-in.

SOIL CLASSIFICATION

For the most part, slope all excavation that are to be entered according to Option 1. When Option 2 is used to determine the slope of excavation sidewalls, soil classification will be performed. Documentation of the classification is required. Soil and rock will be classified into one of four categories. They are:

Stable Rock: Natural Solid Mineral Matter

Type A: Cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

- The soil is fissured.
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects.
- The soil has been previously disturbed.
- The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater.
- The material is subject to other factors that would require it to be classified as a less stable material.

Type B:

- Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa).
- Granular cohesionless soils including: angular gravel (similar to crushed rock), silt loam, sandy loam and, in some cases silty clay loam and sandy clay loam.
- Previously disturbed soils except those which would otherwise be classed as Type C soil.
- Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration.

- Dry rock that is not stable.
- Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C:

- Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less.
- Granular soils including gravel, sand, and loamy sand.
- Submerged soil or soil from which water is freely seeping.
- Submerged rock that is not stable.
- Material in a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper.

Slope configurations for soil types A, B, and C are indicated at the end of this section. When classification is performed, the competent person will use at least one visual and at least one manual analysis as described below:

Visual Tests. Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

- Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.
- Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
- Observe the side of the open excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.
- Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

- Observe the opened side of the excavation to identify layered systems. Examine layered systems not identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.
- Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.
- Observe the area adjacent to the excavation and the area within the excavation for source of vibration that may affect the stability of the excavation face.

Manual tests. Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

Plasticity. Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/2 -in. in dia. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a 2 in (50 mm) length of 1/2-in. thread can be held on one end without tearing, the soil is cohesive.

Dry Strength. If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

Thumb Penetration. The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488 - "Standard Recommended Practice for Description of Soils (Visual - manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification the soil must be changed accordingly.

Other Strength Tests. Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.

Drying Test. The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately 1 in. thick (2.54 cm) and 6 in. (15.24 cm) in dia until it is thoroughly dry.

- If the sample develops cracks as it dries, significant fissures are indicated.
- Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an unfissured cohesive material and the unconfined compressive strength should be determined.
- If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

Layered Systems. In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

Reclassification. If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

EXCAVATION SAFETY CHECKLIST

(This form is to be completed daily.)

Project: _____

Project #: _____

Competent Person: _____

Date: _____

Utilities Checked

_____ Telephone

_____ Sewer

_____ Electric

_____ Cable TV

_____ Natural Gas

_____ Other

_____ Water

Secure Surface & Overhead Structures

_____ Power Poles

_____ Buildings/Foundations

_____ Overhead Obstacles

_____ Sidewalks

_____ Roads

_____ Other

Trench Depth

_____ 0-5' _____ 5'-10' _____ 10'-15' _____ 15'-20' _____ >20'

Egress

Ladder Present in Trench _____ Yes _____ No

(Ladder required at trench depths of 4' or greater)

(Ladder to extend 36" above ground surface)

(Ladder or ramp within 25' of linear travel in either direction)

Soil Classification

Visual Analysis of Soil

_____ Cracks/Fissures/Spalling of Trench Sides

_____ Water Seeping From Sides or Bottom

_____ Different Soil in Layers

_____ Soil Previously Disturbed

_____ Underground Utilities Present

_____ Continuous Vibration Present

Penetrometer Reading: _____

	<u>A</u>	<u>B</u>	<u>C</u>
Penetrometer Reading	≥ 1.5 tsf Not Previously Disturbed Stable Dry Rock	1.5-0.5 tsf Previously Disturbed Cracks Fissures	<0.5 tsf Previously Disturbed Seeping Soil Wet Soil
Maximum Slope	53 deg. (3/4:1)	45 deg. (1:1)	34 deg. (1-1/2:1)

Vehicular Traffic

Area Properly Barricaded	_____ Yes	_____ No
Reflective Clothing Worn	_____ Yes	_____ No
Flagman Present as Necessary	_____ Yes	_____ No
Protective System in Place to Prevent Vehicles Unloading Fill Materials From Backing into Excavation	_____ Yes	_____ No

Other Hazards

Check for Hazardous Atmospheres

_____ Oxygen _____ Combustibles _____ Organic _____ Vapors _____ Other

Confined Space Permit Acquired	_____ Yes	_____ No
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Excavated materials and equipment at least 2 feet from edge of excavation and no other overhead hazards to personnel in excavation	_____ Yes	_____ No
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Water removed from excavation	_____ Yes	_____ No
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Ramps, Walkways, Bridges over Excavations Equipped with Handrails	_____ Yes	_____ No
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Shoring System Designed by Professional Engineer	_____ Yes	_____ No
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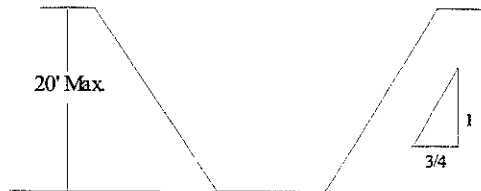
Excavations Barricaded or Filled in at End of Day	_____ Yes	_____ No
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SLOPE CONFIGURATIONS

(All slopes stated below are in the horizontal to vertical ratio)

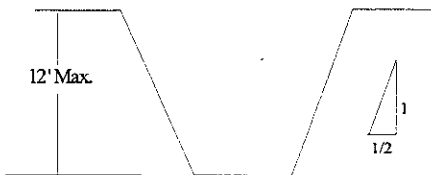
Excavations made in Type A soil.

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 3/4:1.



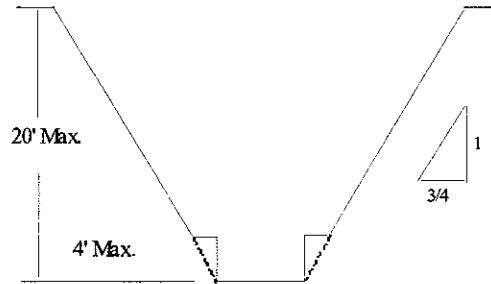
Simple Slope -General

Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of 1/2:1.



Simple Slope - Short Term

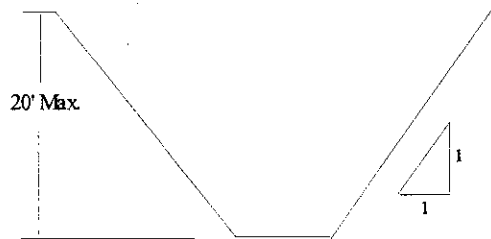
2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of $\frac{3}{4}$ to 1 and maximum bench dimensions as follows:



Simple Bench

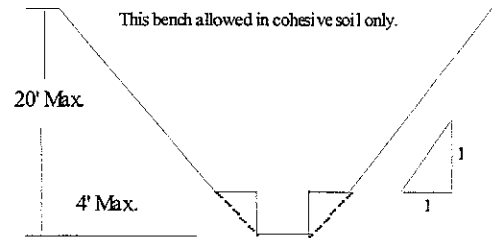
Excavations Made in Type B Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.



Simple Slope

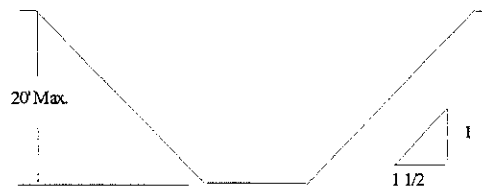
2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows:



Single Bench

Excavations Made in Type C Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1 1/2:1.



Simple Slope

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